PACIFIC DISCOVERY

50 CENTS

CALIFORNIA ACADEMY OF SCIENCES

March-April 1953

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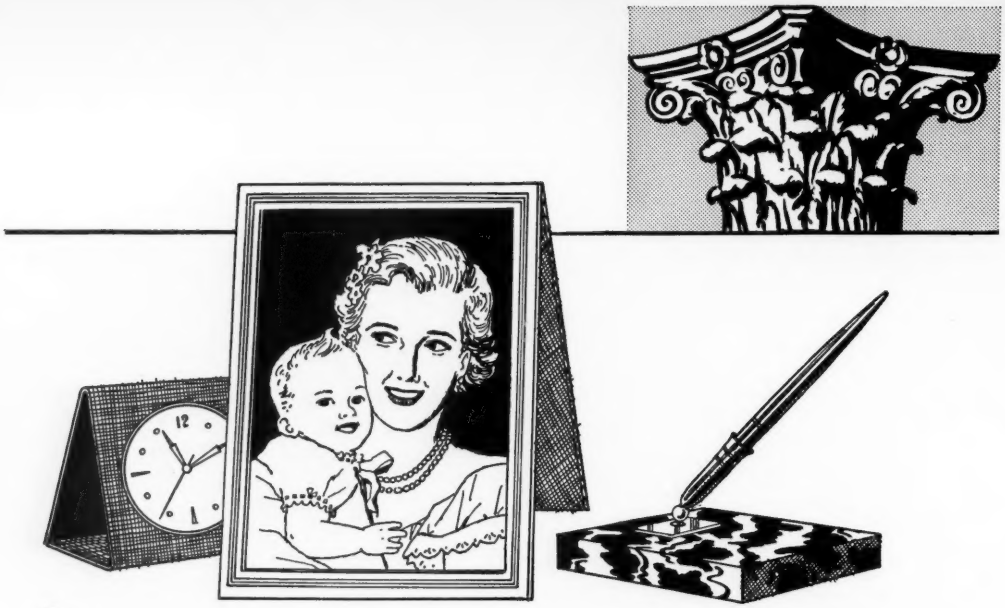

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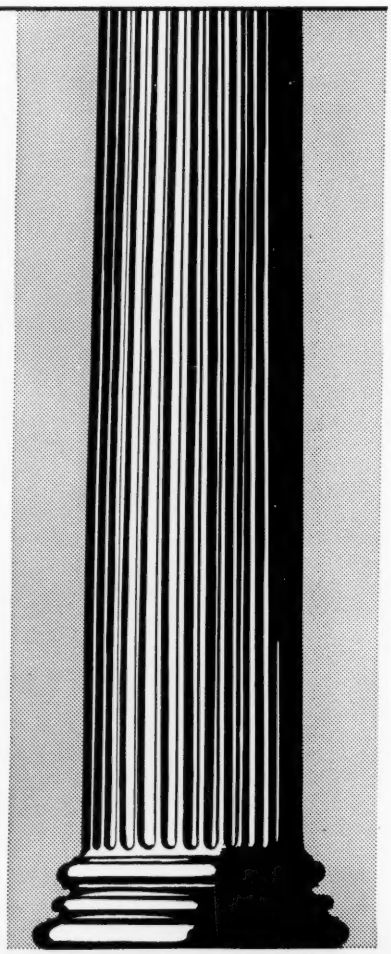

A JOURNAL OF NATURE AND MAN **PACIFIC DISCOVERY** IN THE PACIFIC WORLD

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1953

PRE-DISCOVERY

" 'NATURE is made up of the hunted and the hunters.' This rather unexpected statement, in English, was made to the writer in the course of the bloody business of butchering some twelve huge walrus carcasses out on one of the moving ice floes of the Arctic Ocean. The speaker, an Eskimo hunter, was not merely voicing a platitude; it was plain that his sentiment was based on the careful observation, through his lifetime, of man's struggle to live in a hostile Arctic environment.

"Any ethnological study of the Far North must take particularly into account the relation of man to nature. . . ." The writer is Dr. Robert F. Spencer, associate professor of anthropology in the University of Minnesota. His account of one phase of life among present-day Eskimos at Barrow is a feature of our special Alaska issue for May-June. Two of our associate editors were well set for the planning of this forthcoming number. Dr. Wiggins – at whose invitation Dr. Spencer wrote his article for us – is rounding out another year as director of the Arctic Research Laboratory at Point Barrow; and Dr. Leopold spent last summer flying a wildlife food survey of the barren grounds. The two of them held an editorial conference on the edge of the Arctic Ocean – the farthest northwest (with apologies to R.C.M.) *PD* editorial conference held, so far (this record should stand because there is no farther northwest on the North American continent).

Just a year ahead of the Academy, another American scientific institution has completed its first century. The American Geographical Society stands foremost among geographical research institutions, and has indeed been one of the world's most important learned societies throughout most of its life. The Academy's humble salute to AGS appears at the end of this issue as a review of *Geography in the Making*, the story of its first hundred years.

PD apologizes to Willard N. Bascom of Scripps Institution of Oceanography for inadvertently copying a photo credit to "William Bascom" (January-February 1953, p. 29). The correct Willard N. Bascom recently directed a bathymetric survey of the Palmerston Atoll area aboard the Scripps research ship *Spencer F. Baird*. . . . One of the best articles ever to appear in *PD* was "Huckleberry Pilgrimage" in our Northwest issue last May-June. One of the happiest recollections of the editor and his wife is of an all-too-brief visit with the author, last summer, in his cabin on the slopes of Mt. Adams. Word has just come that Ray M. Filloon, forester and beloved friend of Northwest Indians, died this winter of a heart ailment.

DISCOVERING PD'S AUTHORS

Joyce Rockwood Muench and her noted photographer husband, **Josef Muench**, are together "In the Land of the Goblins," as they have been in many magazine features of the Southwest. Their home is in Santa Barbara. . . . ¶ "Sidewinders" may not appeal as strongly to some people as to **Dr. Raymond B. Cowles**, professor of zoölogy in the University of California at Los Angeles, but their structure and ways are sufficiently fascinating for even a confirmed ophiophobe to understand an ophio*phile's* enthusiasm for studying them in both field and laboratory. . . . ¶ The history of the Academy is quite naturally a matter of great personal interest to the Academy's director, **Dr. Robert Cunningham Miller**. . . .¶ One of Dr. Miller's students, of his university days, was **Margaret Irwin** of the Santa Barbara Museum of Natural History, who looked into the scientific aspects of "Steel-Boring Sea Urchins." . . . ¶ When **George W. Bunton** and **Leon E. Salanave** of the Academy's Morrison Planetarium offered to supply an Astronomy page *each issue*, we took them up on it. We can guarantee they'll never run out of stellar material–the sky's the limit. D.G.K.

IN THIS ISSUE

THE COVER COPY

CALIFORNIA ACADEMY OF SCIENCES on its one hundredth birthday–or as close to it as weather and the *PD* schedule would permit. A far cry from the 1853 "cabinet of specimens"! Clyde Sunderland of Oakland is the flying photographer.

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Science Moves West

ON APRIL 4 of this year the California Academy of Sciences will be one hundred years old. The occasion marks the establishment of science's first home in western North America. It also should be a time to reflect on why it was possible for such an institution to become established so rapidly in what was then a frontier outpost far removed from the learned centers of the world.

Before 1853 scientists thought of the West much as we now think of remote, seldom-visited places like the interior of New Guinea or the headwaters of the Amazon. The West was a virtually unexplored spot on the scientific map – a place to visit to make observations and to collect specimens but not a place to linger. Research on the specimens collected was done later in the explorer's home institution in Europe or on the Atlantic seaboard of America.

The first Europeans to visit the West were not scientists. The Spanish contributed practically nothing to scientific knowledge except through the observations of their Jesuit missionaries before their expulsion from New Spain in 1768. Certain Russian, English, French, and Spanish vessels that briefly touched western shores between 1741 and 1800 had scientists of sorts on board. Their observations and limited collections were the first to reach Europe. It remained for the Russian expeditions of the early 1800s, with Von Chamisso and Eschscholtz as scientists, to make the first important collections. The California poppy bearing the name *Eschscholtzia californica* Chamisso is a souvenir of these important visits. The stories of the West's fabulous flora, especially its trees, reached Europe, and the ever horticulturally minded Britons sent David Douglas on his exciting seed and specimen collecting trips of the period 1824-32. Thomas Coulter, the Irish botanist, was busy in California at the same time.

Up to this point almost all of the expeditions were European, but soon American scientists from the Atlantic coast developed an interest in the West. Townsend and Nuttall left Philadelphia in 1832 on their famous overland expedition to the coast. In 1838 the well-staffed United States Exploring Expedition under Lieutenant Wilkes sailed around the Horn and spent considerable time in the coastwise exploration of the American Northwest. Other Americans, surgeons in Indian forts and members of surveys, were soon to add to the stock of research material from the West. But the region still lacked resident scientists or scientific institutions of its own.

As late as 1835 the village of Yerba Buena which was destined to become San Francisco, the home of the West's first scientific institution, didn't exist. By 1846, however, owing to the favorable landing place for ships, a village developed on the shores of Yerba Buena Cove. The village boasted twenty or thirty buildings and a population of two hundred. No one dreamed that in a mere seven years a bustling city of 50,000 persons would arise on the spot. Yet this is exactly what happened, and what is even more remarkable, the San Francisco of 1853 was already sufficiently mature to have a full array of cultural institutions, not the least of which was the California Academy of Sciences.

What brought this about? Why did San Francisco develop such an early interest in cultural institutions? One of the reasons was San Francisco's isolation. It couldn't lean on any nearby community as frontier towns had done in the past. The main reason, however, for San Francisco's rapid advance was the special character of its population and this in turn was due to the gold rush which began in 1848.

San Francisco's citizens were adventurous young men from all parts of the world and all levels of society. A high percentage were well-educated Europeans who were anxious to escape intolerable political conditions developing at home. There were many doctors, lawyers, and other professional men who came for a fling at adventure, planning to return home to a quiet career. But California and San Francisco had much more than gold to offer the forty-niners. The appeal of the West gripped them, and they remained to develop this most western outpost of European civilization.

They were a vigorous lot – a population of doers. Each was like a plant directly transplanted "roots and all" into a new fertile soil. Having made the decision to stay, these pioneers at once wanted to make the new city as good as or better than any they had left behind. San Francisco was like a clean slate. Very little of the old had to be removed to make way for the new. This applied to structures and institutions as well as to ideas. In this favorable climate, schools, churches, newspapers, and cultural institutions appeared and began to flourish.

San Francisco never had an indecisive youth. It rose almost at once to full maturity. Is it any wonder that it has an Academy of Sciences almost as old as itself?

It is unwise, however, to dwell on one's antiquity and the glory of the past. Let us consider instead the position of the Academy today, the present nature of

its environment, and the role it is to play in that environment during the next century.

In a sense, one of the frontier conditions still prevails. The West is still experiencing a great population influx. But the flow is quite different in character from that which suddenly created San Francisco. The present westward shift of population is motivated by rather normal causes. The newcomers are often merely looking for a better place to live, a more spacious environment, in which there is greater hope of gaining an economic foothold than in the more settled East.

Gone is the opportunity to build from the beginning. The West's institutions are already established; the newcomer, and we, may only add to them. But this situation, far from being a lamentable one, presents us with a grand challenge. On the solid foundations that have been established, we can build with the high spirit of adventure that characterized San Franciscans of a hundred years ago.

For the Academy and natural sciences in general there are difficulties to be overcome. In recent years too much emphasis has been placed on applied scientific research. It is true that our stress on the technologies has given us great prosperity and strength of at least a temporary sort, but these technologies owe their existence and their future to pure scientific research.

As the West continues to grow, more of its people will take the time to wonder about the living world around them. A greater appreciation of the value of cultural scientific research will develop, and science will not only serve man's material needs but will more fully satisfy his intellectual curiosity and enrich his life. Scientific knowledge will be more and more sought for no other reason than the love of knowledge.

Of necessity our large tax-supported institutions must emphasize research projects that can be justified in the eyes of the general public. The California Academy of Sciences and similar privately endowed institutions alone remain entirely free to pursue scientific investigations without showing foreseeable practical goals.

Accordingly, the Academy has taken on a huge task, perhaps the broadest possible sweep of institutional activity that can be conceived. It employs as large a staff of scientists as it can. These people are expected to perform the highest function of learned men – namely, the investigation of the unknown.

This vital activity involves expeditions to near and far-off places to gather specimens and data. These materials then must be processed – properly prepared, labeled, and sorted – so that they will be preserved and can be found when needed. This then becomes the "cabinet of specimens" that requires so much expense and staff time to maintain. Not only does the Academy preserve specimens that are being actively studied but it also preserves those that formed the basis of past research as well as those that will be studied by scientists yet unborn.

In its role as a research museum, the Academy thus links the past and the present and establishes a foundation for future studies. Although it is not the objective of the Academy to be just a place in which specimens and data are preserved, the responsibilities involved in performing this important role increase each year. The West vitally needs this service, but in providing it the Academy requires increasing support of its research departments.

Another contribution the Academy makes to science is the publication of original scientific papers and their circulation to scientists and libraries in all parts of the world. In turn the Academy maintains its own large scientific library so that its staff and visiting students may know what has been and what is being discovered.

This research role is really the most important of the Academy's activities, yet it is one that the general public is scarcely aware of. Should the Academy cease this activity, little immediate effect would be felt, but if this happened everywhere in the country our civilization would come to a standstill, and we would soon be dominated by one wherein scientific research had continued.

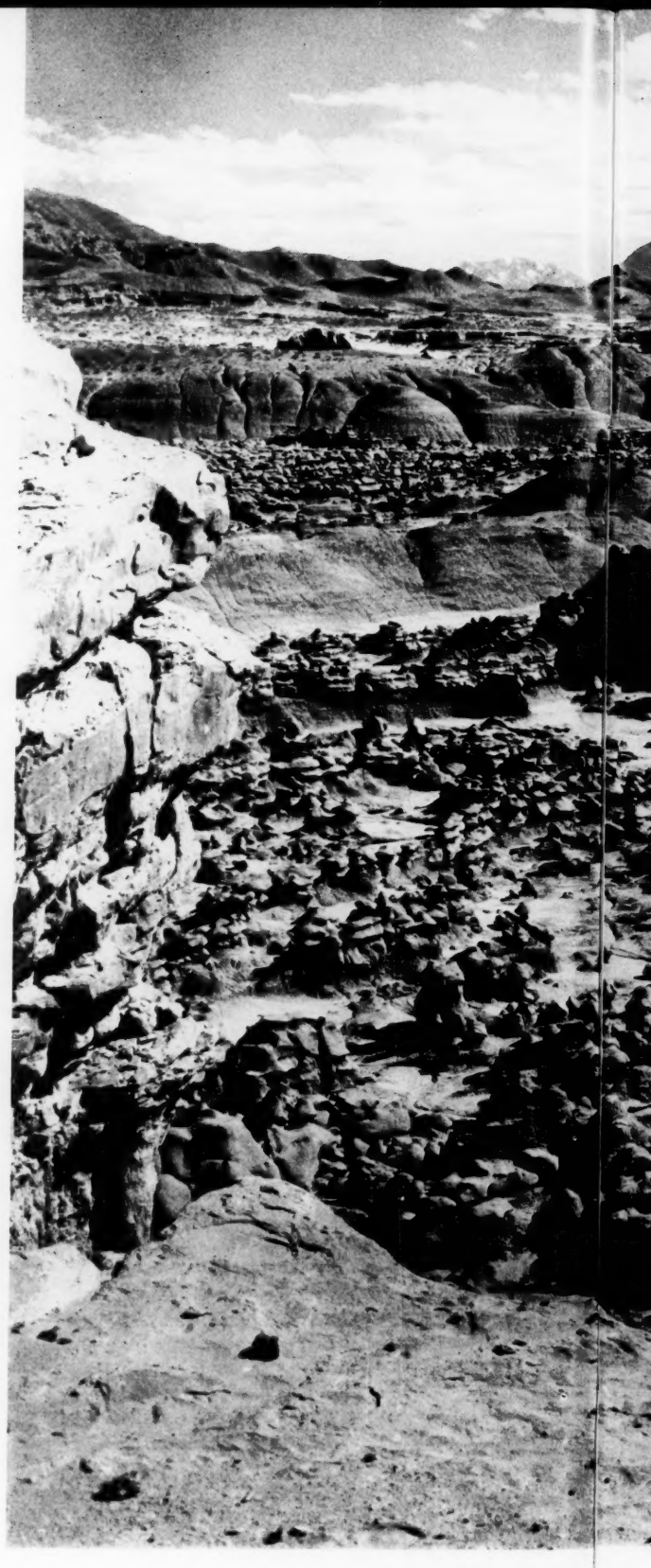
The second major function of the Academy is that of playing "middleman" between scientific discovery and the idea-consuming public. This is the Academy's most understandable function and thus the one that receives the greatest financial support. The Academy plays this middleman role in many ways. It maintains exhibit halls, an aquarium, a planetarium, and a student section. It presents a television show and public lectures, and it publishes popular books and pamphlets. It even publishes a magazine, *Pacific Discovery*, that is gaining a constantly increasing circle of readers. The Academy is glad to provide such services. Through these educational activities the public will come to appreciate the value of studying the world around us.

As we begin our second century we look to new opportunities of service. The accomplishments of the century past have laid a solid foundation. Let us build with a firm, steady hand. E.S.R.

JOYCE ROCKWOOD MUENCH

IN THE LAND OF THE GOBLINS

PHOTOGRAPHS BY JOSEF MUENCH

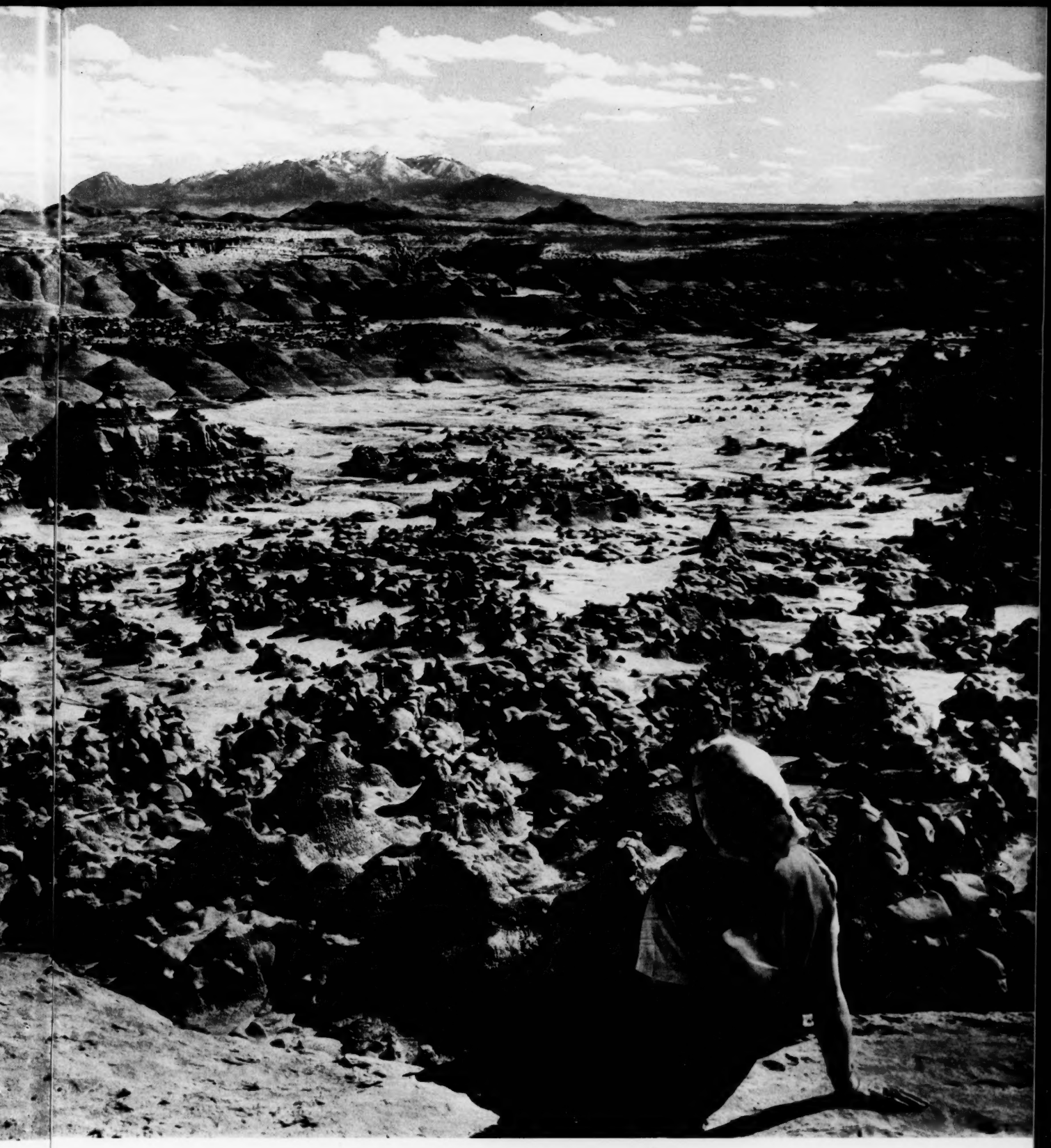


AFTER more than a decade of travel through the Southwest, my husband and I were convinced we had experienced all of its major "scenic explosions." There were still fascinating spots to be visited and photographed, but they had already been explored and could be counted upon to fall within the known patterns. Nature, we felt sure, had nothing new left in her bag of erosion tricks. Certainly no one could ask for more than the Grand Canyon of the Colorado, the greatest abyss on earth; Rainbow Bridge, mightiest of natural stone arches; Zion's deep gorge; the desert skyscrapers of Monument Valley; Bryce Canyon's airy architecture; Chiricahua's Wonderland of Rocks; and still other superlative expressions of landscape.

Then, in the summer of 1951, we came upon the Valley of the Goblins and were confronted with a totally different masterpiece of sculpturing.

Too recently come to notice for an official title, but already being eyed as a potential national monument, the Goblins inhabit a corner of the brilliantly colored Wayne Wonderland in southeastern Utah. Against a backdrop of limitless desert, with the scarp of the Henry Mountains on the south, the rugged San Rafael Swell on the northwest, they beckon from a region where roads are still primitive and the surveyor has been only a casual visitor.

I will never forget that first startling view of the fantastic valley, as we saw it from the top of a sand dune. In a great basin which slopes toward



"Times Square" in the Valley of the Goblins, Wayne Wonderland, Utah. This is looking south, with the snowy crest of the Henry Mountains on the horizon.

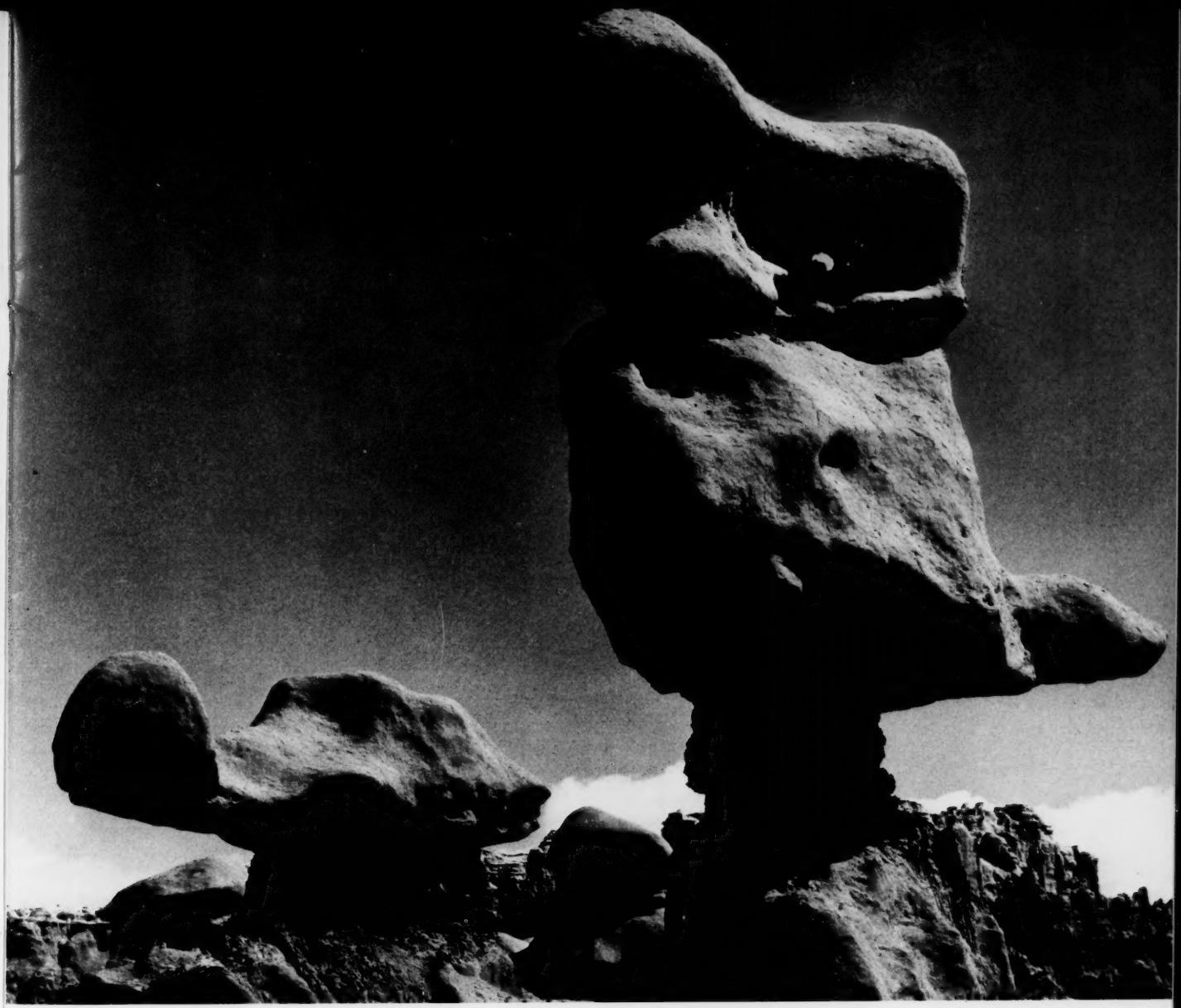
Like finding animals in the clouds — one's own imagination is the only limit to the variety of creatures and characters suggested by these relicts of erosion in the Valley of the Goblins.

the unseen Muddy River, an immense and broken formation of Entrada sandstone erupts from the desert floor. The general color is salmon pink, tempered by soaring gray masses in the background. Countless canyons break into courtyards, and purple striped mounds further confuse the eye. Not a blade of grass softens the stark formations of rock and clay.

All this color and complexity of form would be amazing enough, but the climax of their effect is a sea of goblin faces, thousands of impudent visages superimposed on the rock like a gigantic montage. They leer from each facet of the cliffs and sit in tiers on the canyon walls. Processions of squat and grotesque bodies march down every ridge and stand in groups around sunken courtyards of sun-baked pavement. A studied insolence pervades the very atmosphere of this rock wilderness. The scene is like a slap in the face!

Landscapes sometimes threaten with lowering sky and the promise of imminent storm, a general menace born of wind and rain and withdrawn light. Here the sense of danger suggests personal, particularized malice from orbs behind which there is the visible intention of mischief. We are not alone in reporting this unusual sensation. It seems to have been the experience of all the limited number of visitors to the Goblins, and offers a hint of the fascination of this unique area.

Then, when the first impact subsides as the undaunted newcomer enters the Valley to get acquainted with individual figures, the feeling of apprehension fades. In its place comes a growing delight in the whimsical forms and the astounding variety of shapes. After staring rudely at the stranger, the Goblins accept him and open their ranks, as though a magic threshold had been crossed into a story-book world, as enchanting as the Wonderland of Alice, peopled by a host of now friendly, comical characters.



Being three-dimensional, each has numerous faces, a common peculiarity, we found, among their kind, where chins may swell directly into a great nose or droop onto a protruding stomach, and a hat may be part of the head. Whether recognizable as crude versions of animals, people, birds, or some still-life object, they all have a rotund family resemblance, a pixie quality. There are gigantic toadstools, whole villages in assorted sizes. Tiers of statues in separated amphitheaters are intent upon each other. They are overhead and underfoot, draped over every clay mound and retreating in whichever direction one looks. The number of them is overawing.

Formidable as the canyon walls and background cliffs look at first glance, it is easy to climb out of the Valley up the yielding clay for panoramas of the outlying country. From these lookouts, several hundred feet above the gathered Goblins, we could see more bowls filled by figures, hundreds and hundreds of them, repeating fantasia with variations.

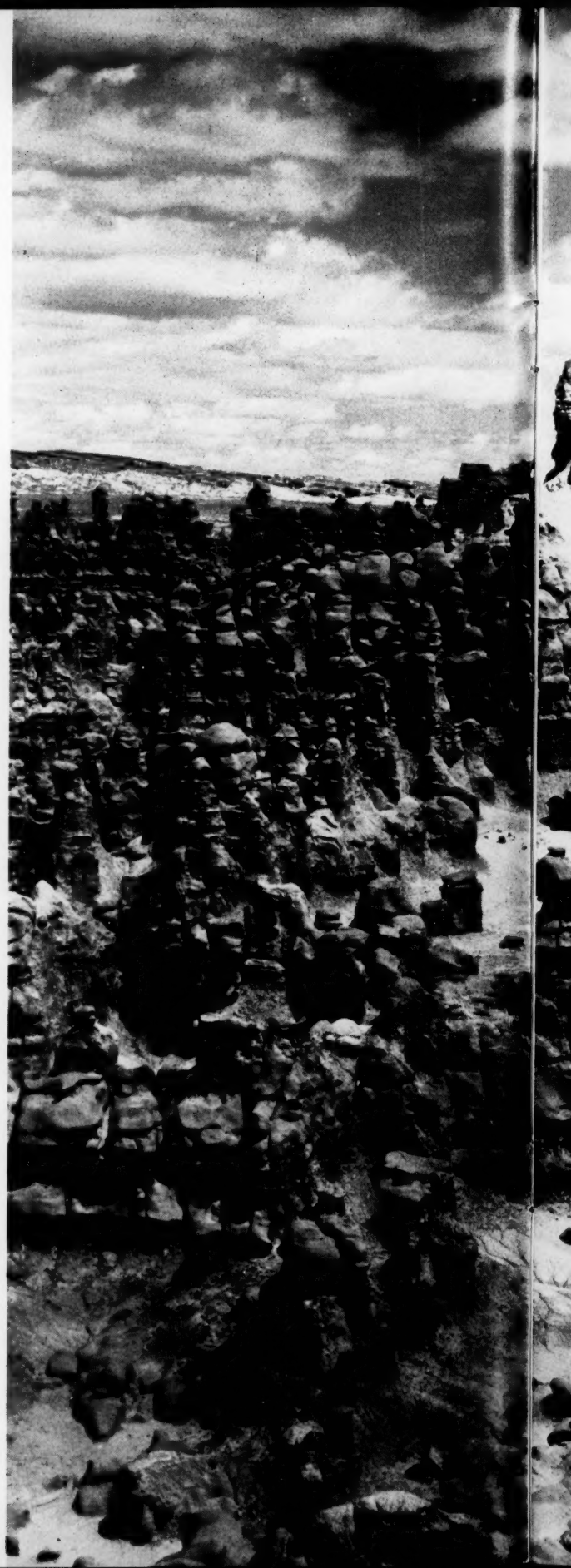
The Goblins have been carved from a remnant of Entrada sandstone, rather miraculously left

here during the ages when it, and adjacent formations of the Upper Jurassic period of Mesozoic time were being stripped from the larger part of the Southwest. It stands upon Carmel limestone and shows, in places, fragments of a blanket (probably of Curtis formation). These layers and the Summerville formation, noticeable on the top of nearby Wild Horse Butte, are included in the San Rafael group, laid down as sedimentary rock in a shallow sea during the "middle ages" of geological time contemporary with the dinosaur. Completely erased at the Grand Canyon in Arizona, the group is represented in Zion by cappings of Carmel on some of the temples and is far older than the Pink Cliffs of Bryce.

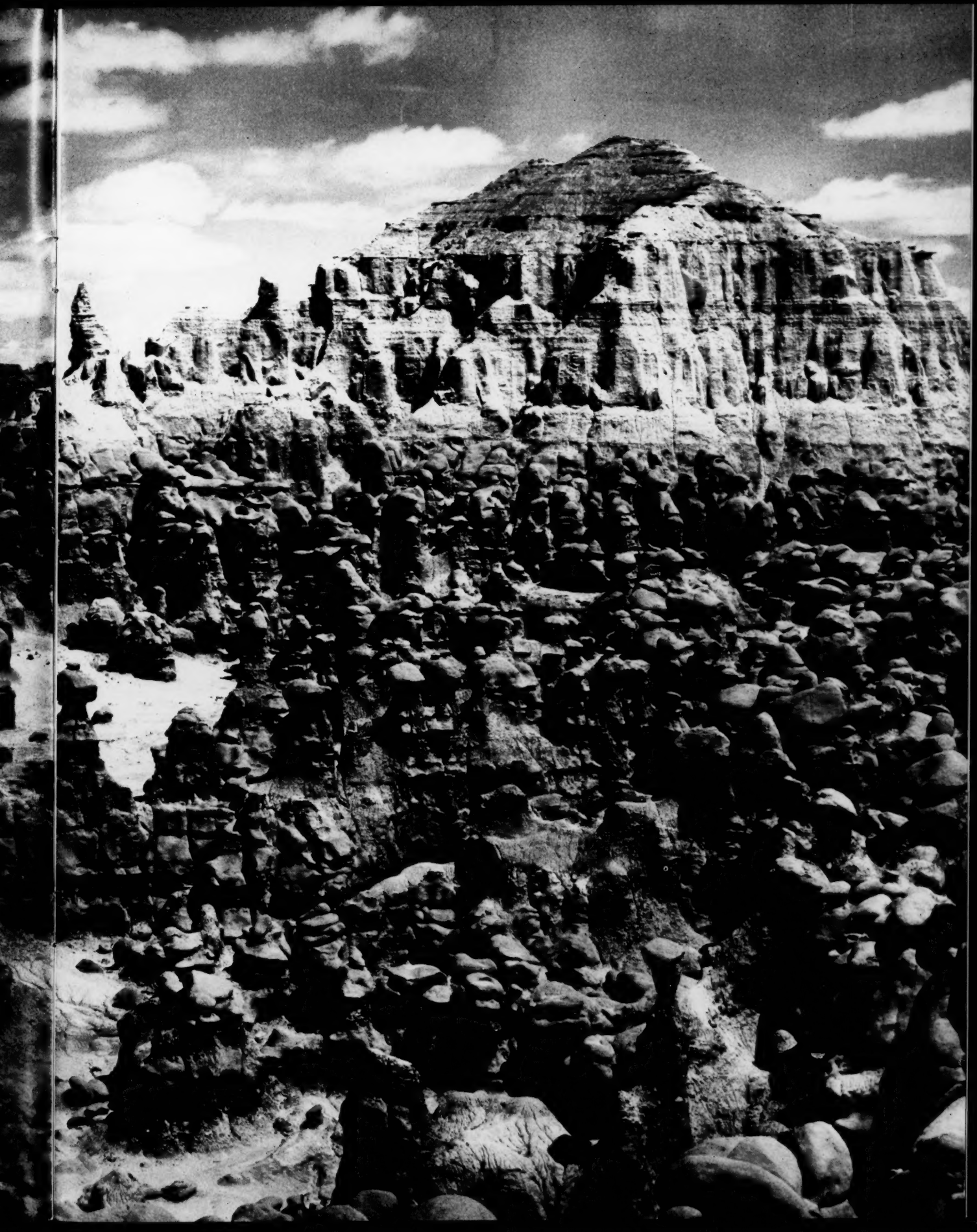
Entrada sandstone is fine, even grained and weakly cemented, making it a perfect medium for water, acids in the air, rain, and winds to work upon. The appearance of markings, like receding shorelines, traceable around the canyon walls, as well as the smoothly rounded form of every rock, suggests the agency of water. Since only several inches of annual precipitation falls here, old age is written clearly on every hand. Where the grayish clay from which some gnomes are just emerging only partially reveals more figures, they have already attained the typical shape, like chicks coming out of their shells. Colorful siliceous geodes, jewel-encrusted, are piled carelessly in the courtyards and roll down the slopes, adding an incongruous touch to the barren floor.

No one who hears about the Goblins fails to ask several pertinent questions. Why, they query, and how, could such an unusual place have remained unknown to this late date? The very mechanics of getting there have already provided the answer to anyone who has seen them.

Southeastern Utah is a great triangular plateau, covering about one-third of the state. As early as 1861 the *Deseret News* had brushed it off with the



In this one view are hundreds of weird figures — work of the master-carver of landscape forms, erosion — straggling down the flanks of Wild Horse Butte.



comment that it was "one vast 'contiguity of waste' and measurably valueless, excepting for nomadic purposes, hunting grounds for Indians, and to hold the world together."

Cattle rustlers and stage-coach robbers found a use for it, however, and today its attractions are recognized at Capitol Reef, the Natural Bridges and Rainbow Bridge national monuments, as well as the beautiful Henry Mountains, Glen Canyon, and now we can add the Valley of the Goblins to the roster.

The region is shut off by the barrier of the Green and Colorado rivers on the east and south. Fierce rapids in the deep canyons of the Green have lured adventurous "white water men" down to Cataract Canyon in the Colorado and the smoother stretches of Glen Canyon, but they offered no chance for crossing the desert wastes further cut by smaller gashes. Hite-on-the-Colorado provides the only vehicular crossing in 300 miles of river, and that only since 1947. At the north are the Wasatch Mountains, sweeping down on the west in what are termed "highlands," although they rise in peaks to 12,000 feet, with one notable gap where Utah State Route 24 comes through from U.S. 89 to make its lonely way on the map, eastward to Hanksville and then angling northward to Greenriver on U.S. 6 and 50.

With the discovery of uranium and the establishment of mines and processing plants there is already improvement in the roads and the eventual pavement for trucks will open the doors for the traveler.

Because the Valley of the Goblins has neither water nor any vestige of feed for cattle, no one bothered until recently to mention its existence, although a few cowboys admit having stumbled upon it from time to time. Its "discovery" is claimed by Art Chaffin, founder of the ferry at Hite, and the Jackson brothers of Fremont, in 1949. That spring they took an amateur photographer and desert enthusiast, P. W. Thompkins of San Francisco, to the Valley on his annual pack trip into southeastern Utah. They went back in 1950 and are now making it part of their guided tours with jeep.

When we went in the spring of 1951, to get what we believe were the first professional photographs, there had probably been not more than a handful of people before us. We owe the delightful experience to Charles Kelly, superintendent of Capitol Reef National Monument.

Armed with exact mileage data, we left Fruita on Route 24 and found no difficulty in reaching the Goblins in an ordinary car. Hanksville is 45 miles to the east where gas, a small restaurant and limited accommodations are available. Two bridges have already eliminated rather tricky crossings of the Fremont and Muddy rivers on either side of the small town, and our only quarrel with 24 as it heads toward Greenriver was the dust. It is 24 miles to a turnoff, left, to Temple Mountain, the 7,500-foot summit of the San Rafael Swell. Garvin Ranch, a cattle outpost two miles west, is passed. Now a frankly primitive but quite passable desert track should be followed, taking every left hand turn for about 12 miles, using the plainly visible bulk of Wild Horse Butte as a guide. Dunes stop even the jeep near the foot of the butte, leaving at the most two miles to walk.

It is necessary to carry water since the only spring anywhere around is of doubtful character. The Jackson brothers report that it was, for many years, the rendezvous of some 10,000 head of wild horses.

After hearing of its inaccessibility, we were almost disappointed to reach the spot so easily. We planned to take a quick look, any pictures which might suggest themselves, and then, after only a few hours, be on our way.

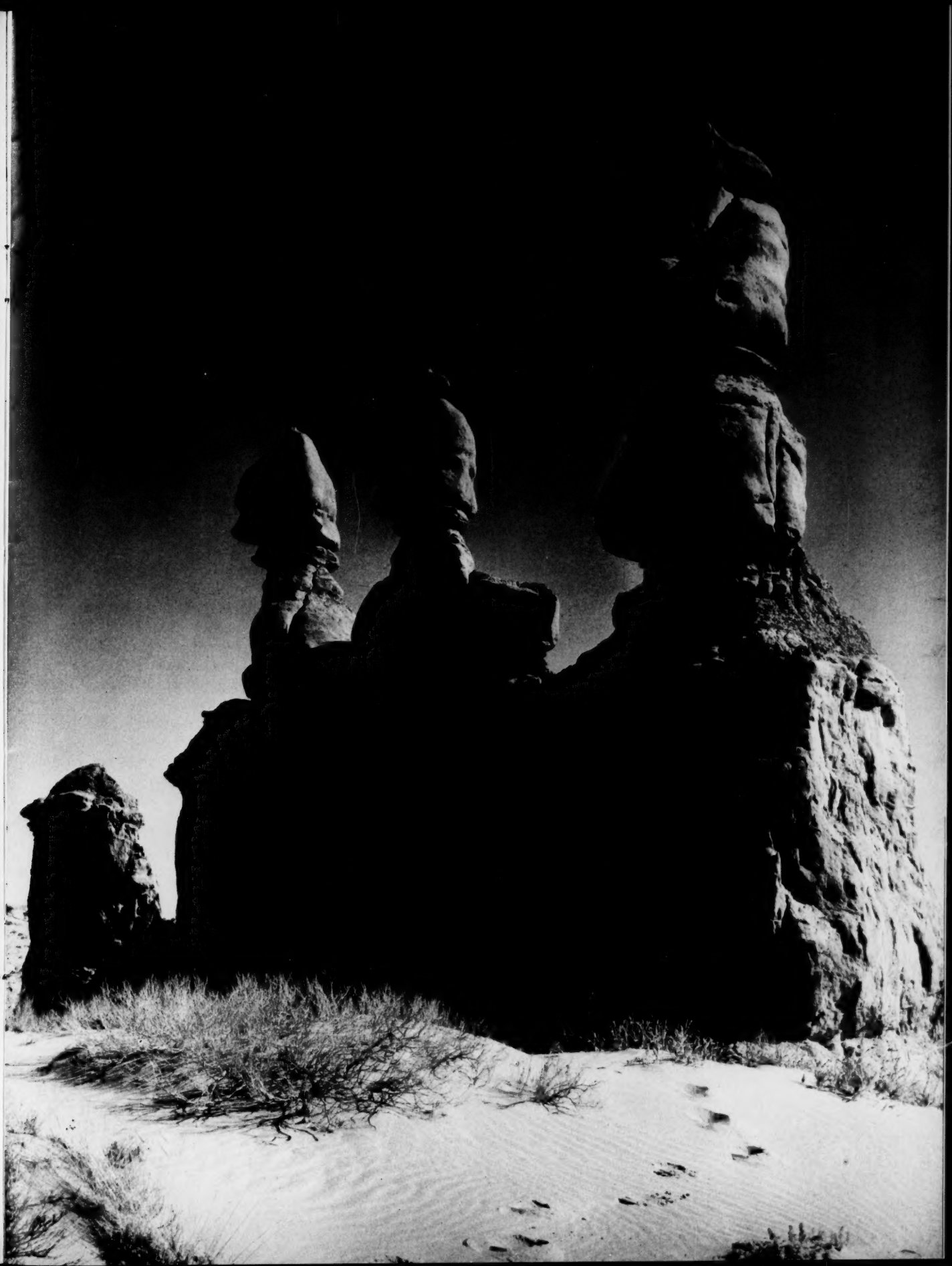
But the Goblins had other plans and we stayed for two days, camping in the shadow of Wild Horse and hurrying back the next morning, with the conviction that it would take several weeks to do justice to our find.

We were alone for the greater part of our stay, seeing two people on the first day and a small party, including the Jackson brothers, on the second. From them we learned some of the names they had suggested for formations.

An immense figure at the edge of the Valley is the "King of the Goblins." There are the "Parade of the Bedbugs," and the "Conference of the Woodchucks." It was up "Goofy Gulch" that we had ascended to the "Queen's Castle" to overlook "Times Square."

The titles themselves suggest the hold upon the imagination which this zany formation has already taken. It is hard to put their grotesque figures out of mind and there is no room for doubt that the Valley of the Goblins will now appear on maps, luring more and more visitors to this area of fantasy and desert stronghold — a new peak in erosional imagery. END

Each distinct layer of rock material responds in its own characteristic way to the agencies of weathering, and can be recognized by its eroded shape as well as by its level, wherever it shows in the fantastic Valley of the Goblins.



RAYMOND B. COWLES

THE SIDEWINDER: master

OF ALL THE REPTILES that intrigue tourists in the famous desert resorts of our Southwest, probably none appeals more strongly to their imagination than the sidewinder. Certainly this little rattlesnake has become the epitome of desert serpent lore. Stories of its deadliness and "vile temper" have spread far and wide. Its habits have been exaggerated and dramatized around almost every desert campfire, and countless "dudes" have been thrilled and terrified to think that in the darkness behind the flickering flames a sidewinder might be lying concealed in the sand, ready to strike a casual stroller.

So famous, or infamous, have sidewinders become that neither tourist nor resident would care to admit he hadn't actually met one of these little snakes. Even in the coastal valleys of California, as well as in the mountains, both far from its real haunts,* people say with pride, "I killed a sidewinder here the other day." Wherever the legends of the sidewinder have reached, almost any little rattler will be misnamed, if only to color a story. Probably no other rattlesnake but the diamond-back is so often miscalled, and so little understood and properly appreciated, as our peppery, somewhat dangerous, but amusing desert denizen.

Actually, the sidewinder's range does not include all parts of the desert. It is at home only where most of the soil is bare – on the vast sandy open spaces, the few sand dunes, and the dusty edges of the Coachella and other desert valleys. More rarely, it is found in graveled arroyos and alluvial fans, or under exceptional circumstances it may wander into the outermost fringes of the rocky buttes, those characteristic up-jutting hillocks or small mountains scattered over the western deserts. Even where its favorite haunts reach right up to thickets of vegetation – alkaliweed, arrow-weed, mesquite – within them it is rare, almost a complete stranger. If found there at all it is undoubtedly a lone wanderer rather than a regular inhabitant of the desert's rare brushlands.

Why are some animals so restricted as to habitat? Successful adjustments to an environment may, so far as we know, depend upon a number of requisites. We often wonder how the animals "know what they need." Why, for instance, can't the western diamond-back rattlesnake live in the mountains bordering its territory where the red rattlesnake, a close relative, seems to thrive? Similarly, the speckled rattlesnake, while well adapted to desert conditions, is rather closely restricted to rocky or rough terrain. Undoubtedly the geographical history of an area has much to do with these adaptations and specializations. Other important factors may be food habits and shelter needs – it is possible that shelter alone might decide the distribution of an animal.

*Dr. Gayle Pickwell, in his *Amphibians and Reptiles of the Pacific States* (Stanford University Press, 1947), gives the distribution of the Mojave Desert sidewinder, *Crotalus cerastes cerastes*, as "Mojave Desert of California from southern San Bernardino County north to southern Mono County, and in southern Nevada, southwestern Utah, and northwestern Arizona"; and of the Colorado Desert sidewinder, *Crotalus cerastes laterorepens*, as "desert regions of southeastern California (Riverside County and southward), northeastern Lower California, northwestern Sonora, and southwestern Arizona" (p. 204).—ED.

The rolling motion of sidewinding is clearly shown in these laboratory photos. Only as the head is lowered against the ground to start a new roll and as the tail is lifted from its last contact with the sand is there any sliding movement. For the rest of the performance each belly scale *(gastrostege)* is imprinted clearly. Note the T mark of the tail, and the first step in making the head J mark. (Strobe photos by Roy Pence)

To the right are tracks of two rolling objects – a jeep wheel, and a sidewinder going in the same direction later. (Photo by the author)

ter of desert travel

For the sidewinder, at least, we can speak with moderate assurance — it is the only North American snake that has developed a highly specialized, broadside method of traveling over bare ground. And it took the vast areas of open space that only deserts have to allow the evolution of such a distinctive behavior pattern as sidewinding. Significantly, the only other snakes to develop this novel "gait" are the small North African vipers living under almost identical conditions; and each of these species has evolved not only in bare country but in one of the two hottest of all deserts.

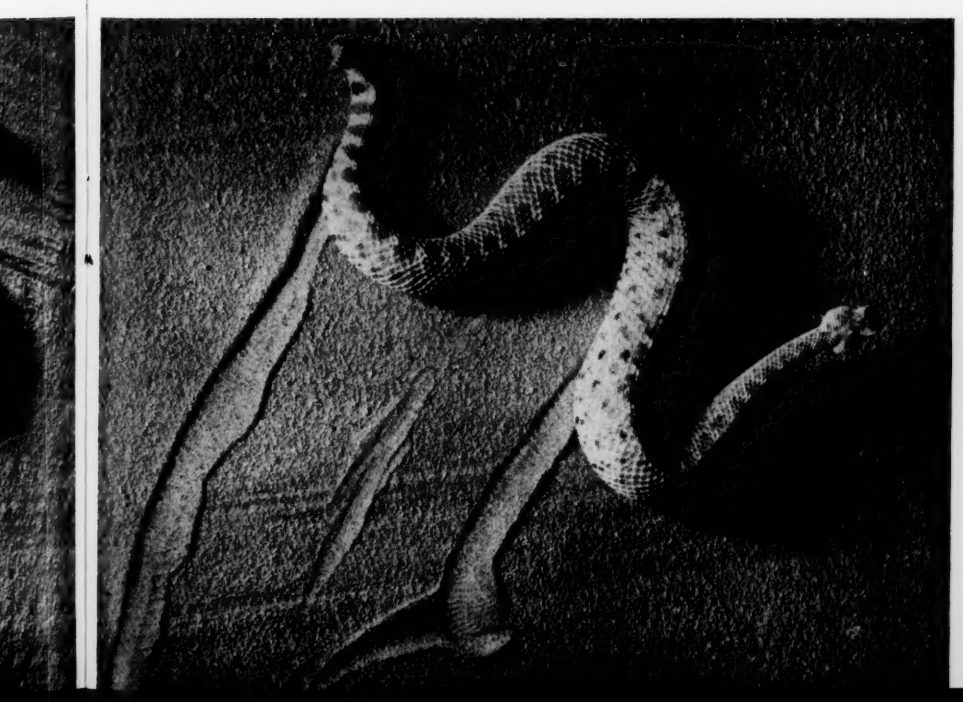
This peculiar kind of locomotion is known only in areas marked by shifting sand or widespread sand dunes. Sidewinding, it is generally believed, evolved specifically for moving over this loose, unstable surface. Observations of sidewinders and North African vipers in their habitats reveal the advantage of their gait — they can "broadside" along the ground at what for snakes is high speed, and even go up the gradual slopes of a dune with no apparent effort. They have trouble only on the steepest, or leeward, slopes, where the sand lies at the angle of rest and even a snake's light touch is enough to start landslides.

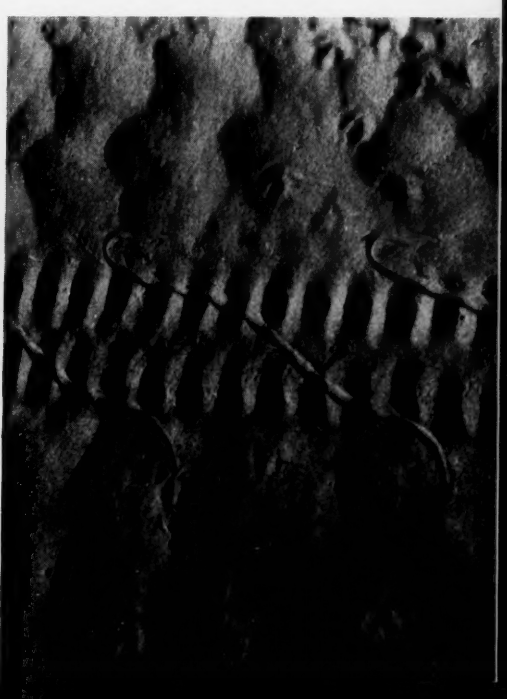
The best way to apply the forces essential to locomotion, obviously, is straight down, as in walking, rather than sideways, as most snakes do. Nevertheless, the many other kinds of snakes living in sidewinder territory use the conventional, horizontal, sideward pushing undulations and also manage to cover the desert fast enough, with much slipping only on the loosest sands. Even over very loose soil the spade-nosed snake, using only "conventional gear," displays the most beautifully symmetrical, unskidded tracks that the desert records.

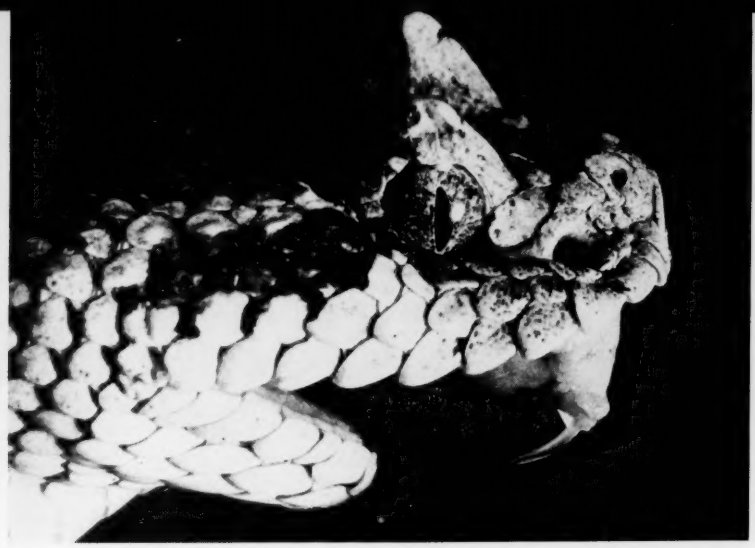
Throughout most of the sidewinder's range the condition of the ground seems to have no effect on ordinary serpentine progression — the western glossy snake, the long-nosed snake, and several other species appear to be without handicap when compared to sidewinders, except as to speed. But these other snakes can either bore into the sand or "swim" below the surface. This may be the adaptation that enables them to live in extreme deserts — as long as they are on soft soil their refuge from heat is always just beneath them.

In trying to find out why sidewinding evolved, we must keep in mind that the historical background and development of deserts have undoubtedly played a major role in the evolution of desert animals, and that these historical events are just as important as present conditions. Deserts did not suddenly come to be. The growth of large sandy areas, especially dunes, is only the latest and possibly the last stage in what has been a gradual changing of climates and resulting conditions for life. As a region became drier, plants grew farther apart, shade and hiding places were scarcer, and there were increasingly large bare areas suitable for sidewinding. Although such conditions would permit this new way of getting around, they would not, on the other hand, necessarily encourage it — except that wide open spaces would put a premium on getting rapidly from bush to bush or to rodent runways and burrows, in search of food, concealment, and shelter from the elements. We must look for another factor.

Throughout the months when both the sidewinders of our deserts and the horned vipers of







North Africa are most active, the surface of the desert in the daytime is extremely hot. It would profit both of these reptiles to be able to move fast, from shade to shade or underground retreat, and at the same time have the least possible contact with an often painfully hot surface. Both of these needs are met by sidewinding. Heat may well have been the decisive factor in the evolution of this special "gait."

These reptiles are especially vulnerable to high temperatures. They cannot stand air temperatures above 90°F. for long, because of increased water losses when heated. Moreover, their habit of bedding down in the open may leave them exposed to increasing heat as the sun rises and the surrounding sands warm to blistering levels – 160°F. or more at the surface – that may kill them in a matter of minutes. The best our sidewinder can do is make a saucer-shaped depression and rake some of the surrounding soil onto its body. This is not good for long. When it gets intolerably hot the snake must race for the nearest shelter or die. His North African counterpart is better off, however – that viper can edge its way completely into the soil where only a few inches below ground there is a sharp drop from the surface reading. The Saharan desert is older and more extreme than ours; it may be that the horned viper has had longer to achieve more perfect adaptation to desert living, with two ways instead of one to escape the heat.

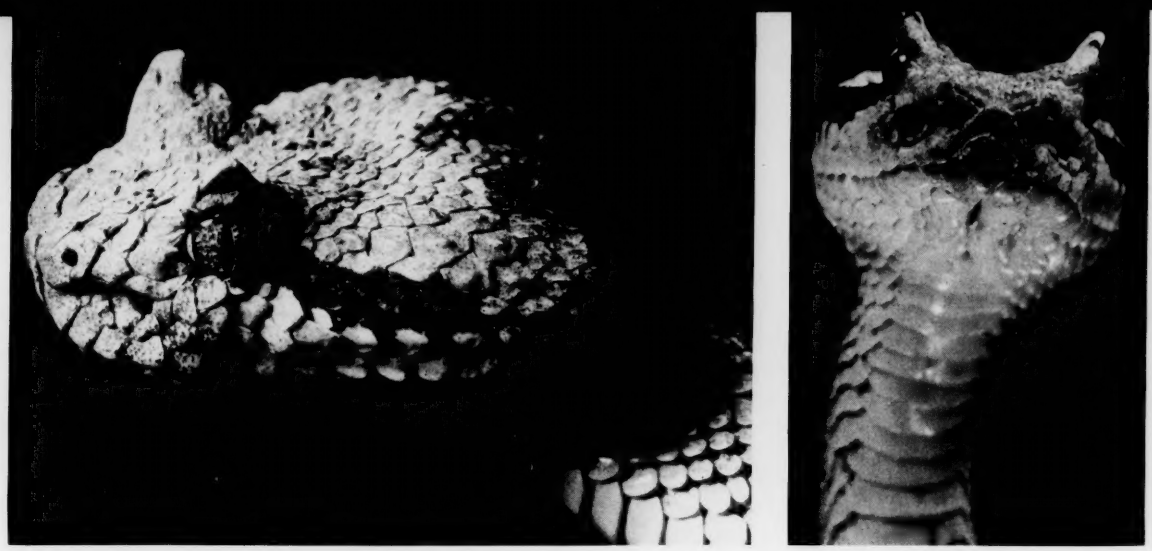
As to the way these things get started, it may be significant to students of evolution that on hot sand other desert snakes – the leaf-nosed, spade-nosed, and spotted night snakes, for instance–will resort to imperfect but effective sidewinding to get off in a hurry. They seem to shift quite simply from the normal to the "rolling" gait in response to great stress.

Actually there isn't much basic difference between the two gaits, and we can see how easy it is to shift from one to the other if we put a sidewinder into shallow water. When the snake is fully floated in this unfamiliar medium, its normal muscular movements will produce the conventional sideways flexing of the body, and it will swim just the way any other snake does. But as soon as the sidewinder is partly on solid bottom again, the same fluid movements automatically put it "in sidewinding gear." The observer can see no mechanical differences in the two types of locomotion. Most remarkable of all is the ease with which the sidewinder shifts from its own special movements into the side-to-side swimming "strokes," and back again – even though it practically never uses the ordinary snake movements on dry ground.

Would other snakes, we might wonder, have taken to sidewinding as a better method if their home ground had been free of obstructions, such as rocks, plants, and so forth?

Just as distinctive as the sidewinder's gait are the "horns" above its eyes, from which it gets its other common name – horned rattlesnake. They are actually projecting scales. Anything so prominent might be expected to have some use, but in spite of much speculation about them we are still left with the probability that the sidewinder's "horns" just are – a whim of evolution. The theory that they are meant for eyeshades doesn't stand up under close study of the shadows they cast; moreover, the horns of our snake's opposite number, the horned viper of the Sahara, are in fact near the center of the head where they can't possibly shade the eyes.

(Left) **When a sidewinder is poised in the alert position, the exploring tongue is protruded nearly to its full extent. From this angle the horns seem to have the effect of eyeshades.** ***(Right)*** **This profile shows the fangs, an eye slit partly open, and the small nostril and large loreal pit openings. (Roy Pence)**



The eyes themselves are designed for desert living – the sidewinder doesn't need eyeshades. Everyone who has been in the desert on a bright day knows how painfully intense the light can be, especially in open places with a reflecting sand surface and no shade at all. For entirely nocturnal animals this is no problem. Having excellent night vision, they rarely need to go out in the daylight. Although chiefly nocturnal, and equipped with that type of vision, the sidewinder goes abroad in the daytime enough to need "bifocals" – or, at any rate, eyes adaptable to very intense light as well as to full darkness. Under bright light the vertically elliptical pupils contract to almost invisible slits (reminding us of Eskimo snow-goggles with their narrow horizontal slits).

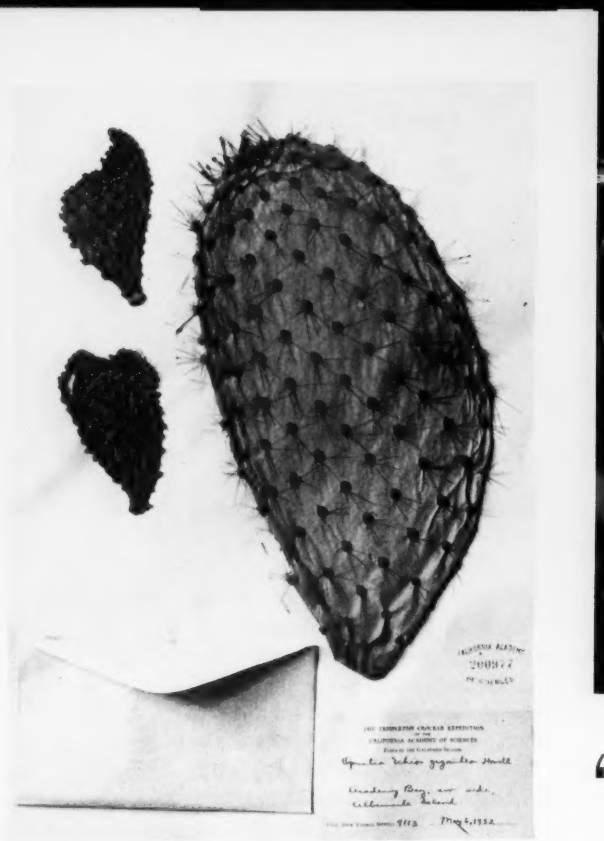
Like other rattlesnakes, the sidewinder is equipped with the remarkable, almost unique sense organ for which the pit-vipers (family Crotalidae) are named. These mostly New World snakes have a facial pit that leads down into a structure of nerve endings that can detect extremely small differences in heat radiation. Because infrared or heat waves are invisible it is difficult for human beings to appreciate their usefulness or have much insight into the problems of what might be called infrared "vision."

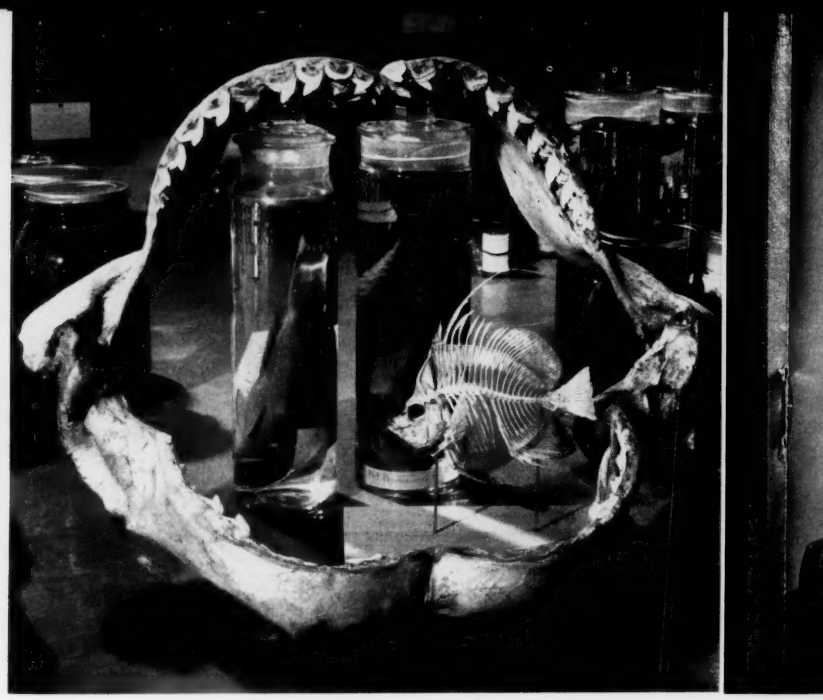
These loreal pits point straight ahead on either side of the snout to pick up the heat radiated from a warm-blooded animal. When the two pits register equal degrees of heat, the pit-viper is "zeroed in" for a strike. The nerves from the pits go directly to the brain, so the information they pick up passes immediately to the point of action-control.

There is no evidence that snakes can hear – only the credulous human audience is affected by the snake charmer's eerie piping – but all snakes have another device to keep in tune with their surroundings, the tongue. How many harmless snakes are accused of "sticking their fangs out" at people, with imagined ominous intent! Obviously, if one stops to think, no snake could "flicker" or stick its *fangs* in and out. That darting forked thing is just one of the sensory receptors the snake depends on to judge what is going on around it. The remarkable fact is that the snake cannot taste with its tongue, but uses it to pick up molecules of "tasted" or "smelled" substances and transport them to another organ, in the roof of the mouth, where these substances are "analyzed" and the judgment as to their nature passed on to the brain. It is comparable to a dog's sniffing the air or various objects in its path.

Year by year more of our vast deserts are being used one way or another by man, but their greatest beauty and richest values lie in their wildness – what is left of it. Our chief pleasure in such places lies in the understanding and appreciation of all their varied life, of the interwoven pattern of nature, in which even the sidewinder has its fixed place, however inconspicuous. We can enjoy the knowledge of its marvelous adaptation to one of the sparsest environments in which any animal is at home. When you are out in desert moonlight, try to see one materialize out of nowhere, its almost invisible body blending into the sand, so that often the shadows under the sidewinder's loops seem to have more substance than the snake itself. It will not attack unless provoked. Given a chance it will roll rapidly and noiselessly toward shelter, the ghostly silence broken only now and then as it pauses to sound off with an absurdly weak buzz of its rattles. **END**

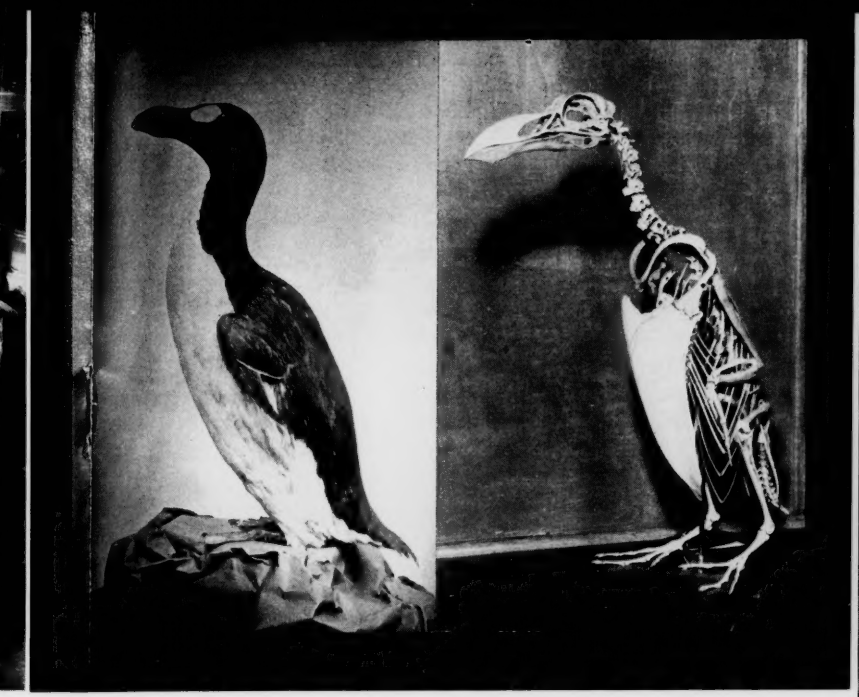
(Left) The shading shows the groove leading to the loreal pit back of and below the nostril. (Right) Head-on, the loreal pits look like deepset eyes, but the position of the eye is perfectly clear in the side view. (Roy Pence)





"A CABINET OF

The scope of the Academy's departments and the extent of its collections cannot be realized from a few pictures, but something of their variety can be suggested. Departments and collections represented are (clockwise from upper left): *Botany* — an herbarium sheet with a new subspecies of prickly pear cactus collected in the Galápagos. *Fishes* — alcohol jars seen through shark jaws. *Birds and Mammals* — the great auk is represented by one photo and one skeleton. *Paleontology* — Dr. Leo G. Hertlein, the curator, examines an am-



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monite. *Minerals* — gypsum crystals are part of the Vonsen Collection being installed in the Hall of Sciences (the Pitts Collection is displayed in North American Hall). *Reptiles* — one of the giant Galápagos tortoises, seeming to stare at part of the Maude Rex Allen Lamp Collection. Next, here as in the Hall of Sciences, is a sample of the Stephens Horological Collection. *Insects* — the late curator emeritus, Dr. Edwin C. Van Dyke, examines a newly acquired private collection, part of his legacy to the Academy.

HIGHLIGHTS 1853-1953 OF A HUNDRED YEARS

Robert Cunningham Miller

SAN FRANCISCANS are proud of their noble city that sits enthroned beside calm waters, and as Queen of the Pacific receives homage and tribute from all seas and oceans. Richly freighted ships from every land visit her harbor. Her buildings are becoming palaces, and her merchants, princes. Wealth, gaiety, and luxury characterize her people. She is fast approaching that peculiar and regal character which in days of old was borne by the great maritime cities of the Mediterranean. . . ."

These modest lines were written, not of the San Francisco of tomorrow, nor of today, nor even of the expansive era of the Nineties. On the contrary, they present a picture, if we may trust the testimony of an annalist of the time, of San Francisco in 1853. The quotation is from *The Annals of San Francisco*, by Frank Soulé and others, published by D. Appleton and Company in 1855. Let modern press agents take notice. Truly there were giants in those days!

On the same page with this stirring account of the splendors of a nascent metropolis, our chronicler informs us in more sober vein and with greater attention to factual detail: "Many new streets were planked for the first time, and some of the old ones replanked. . . . Already portions of Montgomery and Washington streets are finely laid down with cobblestones." In order to appreciate this enthusiasm for what may seem a very modest achievement in civic improvement, we need to recall that, in the wet winter of '49, a mule is said to have sunk in the mud of Montgomery Street and drowned before it could be extricated!

It was amid such scenes of Mediterranean magnificence and "regal character" that, on the evening of April 4, 1853, seven men assembled in a candle-lit room at what was then 129 Montgomery Street, and founded the first academy of sciences west of the Atlantic seaboard. They elected a chairman and a secretary, discussed their objectives, assigned a committee to draw up a constitution, and selected a name, *The California Academy of Natural Sciences* (this was shortened fifteen years later to *California Academy of Sciences).*

Present at this first meeting were Dr. Charles Farris, Dr. Henry Gibbons, Dr. Albert Kellogg, Dr. Andrew Randall, Dr. J. B. Trask, Col. Thomas J. Nevins (San Francisco's first superintendent of schools), and Lewis W. Sloat, Esq., in whose office the meeting was held. Dr. Randall was elected chairman and Mr. Sloat secretary of the gathering. Each of these gentlemen was subsequently confirmed in office as soon as a more formal organization had been effected, Dr. Randall becoming the Academy's first president, and Mr. Sloat its first secretary.

Those who think of "the horse-and-buggy days" as a time when things moved slowly would find the early history of the Academy a revelation. At the second meeting, held exactly one week after the first, the committee on organization submitted a constitution, which was discussed point by point, with certain revisions being recommended. The constitution was referred back to committee, and three additional committees were appointed, one to draw up a set of by-laws, and two to work on publicity! Of the latter two committees, one was to draw up a circular for publication, "detailing the objects of the association, and specifying the subjects of collection and investigation, and soliciting the cooperation of all interested. . .."; the other was assigned to publish the report of the committee on organization.

This may seem a complicated committee structure for a small group, but it got results. Interest steadily increased, and when the constitution was adopted on May 16, twenty-seven persons were declared eligible to be charter members. It would be difficult today, with modern communication

and transportation, to duplicate this feat of organization. Incidentally, the initiation fee was ten dollars, and dues were two dollars a month *payable in advance* (membership in the Academy is one of the few things that cost less today than a hundred years ago).

These were the men

Of the forty or more men who became members of the Academy before it was legally incorporated on June 27, 1853, all are entitled in a very real sense to be regarded as founders, and even some who came in a little later seem similarly entitled to that distinction. For example, Dr. Hans Herman Behr, who joined the Academy when it was ten months old, remained a strong and stabilizing influence in its councils for fifty years. Because of the difficulty of drawing a line, it has become customary to refer to the founders as the seven men who attended the first meeting on April 4, 1853. This is a practice that goes back to the early years of the Academy, although — for reasons we shall presently mention — the earliest published list of the founders was confined to six.

Henry Gibbons, M.D.

What manner of men were these, who calmly and confidently set up an academy of sciences in a pioneer community on the Pacific shore — a community chiefly built on the twin foundations of thirst for adventure and the quest for gold?

Albert Kellogg, M.D.

Five of the seven founders were doctors of medicine, but it is not to be inferred that the early meetings were clinics. The Academy of Sciences was for them an avocational interest. This is clear from the preamble of the constitution to which they subscribed their names, which reads in part:

"We the undersigned hereby unite in a scientific association . . . for investigating and developing the Natural History of California, and of the Pacific Coast and Islands, and Natural Science generally . . ."

For Dr. Trask, his avocation became his vocation. He had a keen and informed interest in geology, and the same year the Academy was founded he was appointed California's first State Geologist. Dr. Kellogg operated a pharmacy, and in his spare time became a distinguished botanist. Dr. Henry Gibbons followed the practice of medicine (as his son, his grandson and his great-grandson after him), but maintained a strong collateral interest in meteorology and kept careful records of weather and climate, some of which were published by the Smithsonian Institution.

Of Dr. Farris we know little. He was present at the first and third meetings of the Academy. His name does not appear among those signing the constitution, and on June 11, 1853, he was

transferred to corresponding membership on account of leaving the state. For these reasons, presumably, his name is not included in the list of founders published in volume 2 of the Academy's *Proceedings,* only the names of his six associates appearing. He was a man whom greatness touched in passing. We hope that from relatives or friends in other parts of the country we may sometime, somewhere learn more about him.

Dr. Andrew Randall must have been a man of considerable personal force and charm, since he was selected as chairman of the first meeting, and after the organization had been effected, was elected president of the Academy three successive years. On July 24, 1856, he was shot and killed by a gambler named Joseph Hetherington, who was hanged five days later by the Vigilance Committee. The day after Dr. Randall's funeral, and the day before his murderer was hanged, the Academy held its regular meeting, the minutes of which – with almost maddening scientific detachment – give no hint of the turbulent events of the week. They record instead the acquisition by the Library of Michaux and Nuttall's *North American Sylva,* and a pamphlet on coniferous trees!

Of the two "lay" members of the founding group, Lewis W. Sloat (a nephew of Commodore John D. Sloat) was a notary public who engaged also in a real-estate and investment business. He was an amateur conchologist and kept a collection of shells in his office. Colonel Nevins is honored as the founder of the public schools of San Francisco and of California. He was Superintendent of Schools in San Francisco at the time the Academy was founded, and all of the early meetings except the first were held in his office, at what is now 622 Clay Street. Here also the Academy kept its small but growing library and its "cabinet of specimens," the modest beginning from which its great museum collections were to grow.

Gentlemen and scholars

"Scientific gentlemen may be received as resident members." So states section 1 of article 2 of the Academy's first constitution. It would be pleasant to believe that the members unfailingly conducted themselves with dignity, decorum and mutual forbearance befitting the lofty purposes of their undertaking – pleasant, perhaps, but not nearly as interesting as the facts. Human nature being what it is, we find the scientific gentlemen behaving a good deal like anybody else.

The early meetings were, if we may trust the record, conducted with great formality. Everything was done by resolution, and nearly everything was referred to committee. It was "*Resolved* that a committee of two be appointed by the Chair to draft instructions for the preparation of specimens in the various branches of Natural History and directions for their transmission to the association. . . . *Resolved* that a committee of five be appointed by the Chair to make and present a list of such scientific books as are necessary for the immediate use of the Academy. . . . *Resolved* that Doct. H. Gibbons be respectfully requested to permit the Academy to take a copy of his meteorological observations and that he be further requested to furnish an article on the climate of California, suitable for publication."

The secretary, Lewis Sloat, faithfully wrote up these resolutions week after week in a neat and highly legible hand, but sometime during the summer he got either tired of it or distracted by the pressure of other business. At the meeting of September 5, Dr. Kellogg, as acting secretary, wrote pointedly, "Minutes of the last meeting as usual absent," and at the meeting of September 12, it was "*Resolved* that the Recording Secretary be requested to hand over to the Librarian the minutes of the previous meetings not recorded, together with the Record Book that the records may be written up." Thereupon the secretary's resignation was submitted and accepted, and Col. Nevins was elected in his stead. However, it does not seem that Mr. Sloat's nose was badly out of joint, for he continued as a member of the Academy, and from time to time submitted resolutions of his own for his successor to write up. Mr. Sloat was active a few months later in getting the Academy's publications under way.

Drawings by Frank Rinna

One of the most famous resolutions was that introduced by Dr. Kellogg at the meeting of August 1, 1853: "*Resolved*, as the sense of this society, that we highly approve of the aid of females in every department of natural history, and that we earnestly invite their cooperation." It does not appear that this sentiment was immediately reciprocated, for it was a number of years before any "females" sought admission to the company of the "Scientific gentlemen"; but Dr. Kellogg's resolution, far in advance of its time, paved the way for the distinguished botanical career of Alice Eastwood, who has been one of the Academy's outstanding personalities for a good deal more than half a century.

The Academy's interests have been strongly botanical and horticultural from the beginning. In July, 1853, Dr. Randall proposed that the Academy hold an essay contest on the subject of trees, and six months later a prize of fifty dollars was awarded for an essay on vegetation suitable for windbreaks and for holding the soil.

One of the more amusing botanical discussions of this early period was a debate over the specific identity of a wild cucumber *(Echinocystis)*, which went on intermittently for weeks. One member thought it was a new species; another member said no. A committee was appointed to investigate and report. At the following meeting the committee reported "progress," but a couple of meetings later it appeared that no agreement had been reached and the committee asked to be dismissed. A motion to dismiss was voted down, which meant in effect that the committee was told to go back and get busy. But no final report was ever made, and it appears (for reasons that any taxonomist can guess) that this noble effort to solve the species problem in committee was unsuccessful.

We have mentioned Dr. H. H. Behr, who joined the Academy early in 1854 and remained a strong and vigorous force in its activities till his death in 1904. He was a Doctor of Medicine from the University of Berlin, and in 1898, on his eightieth birthday, the University of Berlin renewed his doctorate—an unusual distinction for an alumnus who had spent most of his life halfway around the world. He was a physician by profession, and an entomologist from sheer love of that avocation. On his retirement from the practice of medicine, he became a full-time curator at the Academy and thus spent the last twelve years of his life.

Behr was famous as a wit and raconteur, and is still affectionately remembered by the Bohemian Club, of which he was a member. In an exchange of repartee, he seldom came off second best. During several years of his curatorship the president of the Academy was Dr. H. W. Harkness, an able but crusty person, famous for his salty language. Once, being bested in an argument, he said to Behr, "Oh, go to hell!" To which Dr. Behr replied imperturbably, "After you, my dear Sir."

Behr's most subtle thrusts were so erudite that only scholars could detect them. He had an enemy who attacked him in the press, making outrageous accusations and insinuations. Dr. Behr never replied to these articles and apparently took no notice of them. But presently he discovered a new species of louse, and quietly named it for his detractor.

The Academy's first Museum, a former church building at what is now California and Grant, could scarcely hold this prize exhibit acquired in 1882. The Academy occupied the building from 1874 to 1891.

From the ends of the earth

We have on this coast a virgin soil with new characteristics and attributes, which have not been subjected to a critical scientific examination. Sufficient, however, meets the eye of the naturalist to assure him that this is a field of richer promise in the department of natural history in all its variety than has previously been discovered. It is due to science; it is due to California, to her sister states, and to the scientific world that early means be adopted for a thorough survey of every portion of the State and the collection of a cabinet of her rare and rich productions.

Thus wrote the founders of the Academy, and it was clearly their first intention to concentrate their scientific activities on California. But their first "corresponding members," elected even before a constitution had been adopted, were James C. Swan and Captain C. J. W. Russell from Shoal Bay in what is now the State of Washington. And the first contribution to "the cabinet of specimens" was a gift from Captain Nahum Haynes of shells and corals from the South Pacific, and a shell from the West Indies. Shortly thereafter it received a gift of herbarium specimens from Scotland. Thus the Academy immediately outgrew state limits and began embracing the rest of the world.

The collection did not, however, grow merely by random accretion. Dr. William P. Gibbons, one of the early members, became interested in the viviparous perches of San Francisco Bay, and from its slender resources the Academy authorized a sum up to twenty-five or thirty dollars for the collection of these interesting fishes. Mention is also made in the minutes of "meteorological and magnetic instruments" ordered through Professor Joseph Henry of the Smithsonian Institution.

Expeditions for the collection of specimens in distant places seem to have been started by Dr. Gustav Eisen, who led an Academy expedition to Baja California, Mazatlan, and Panama, in 1893-94. It is interesting to note that Dr. Eisen himself came to California in 1873 on an exploring expedition shortly after receiving his doctorate from the University of Upsala, and liked the region he

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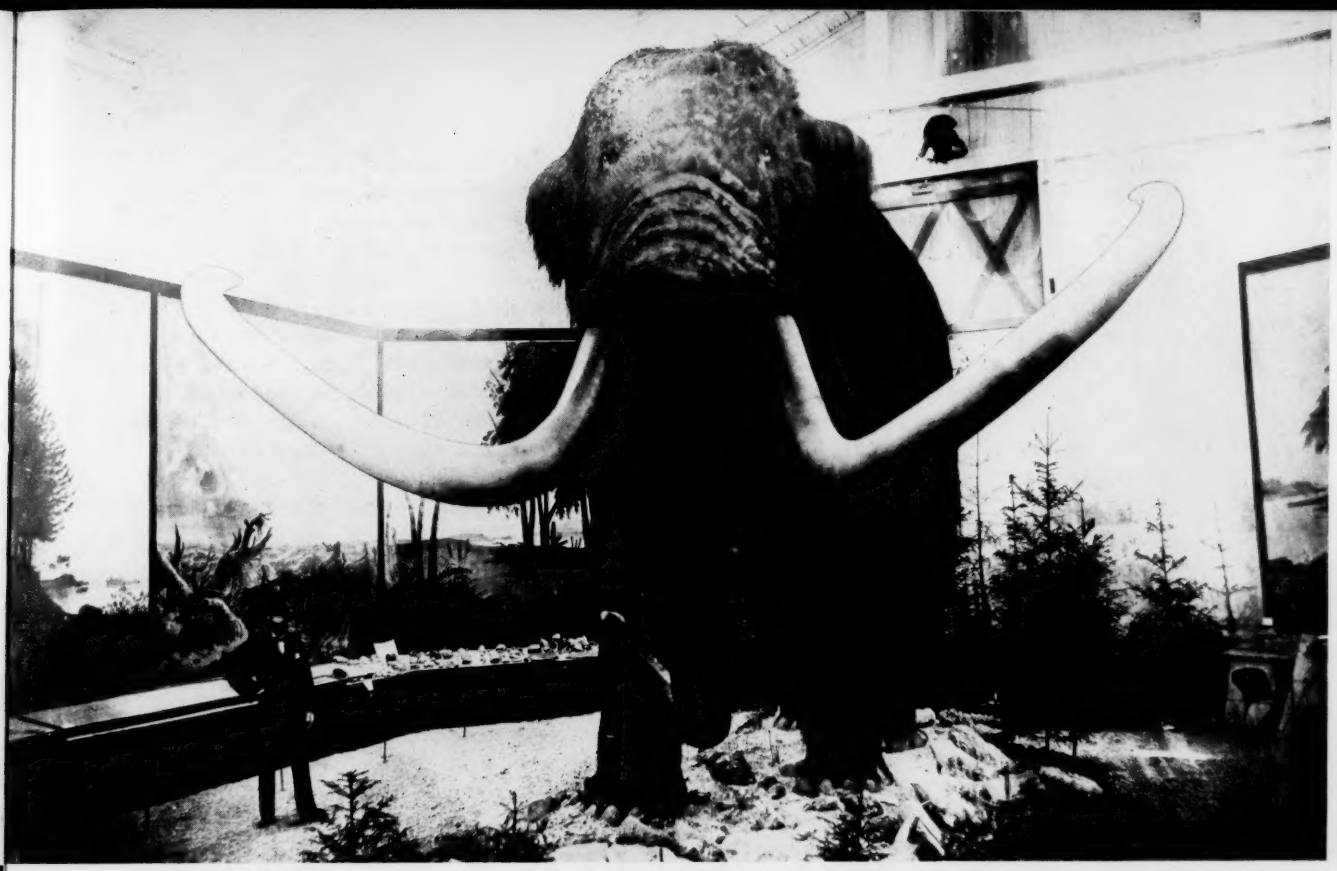
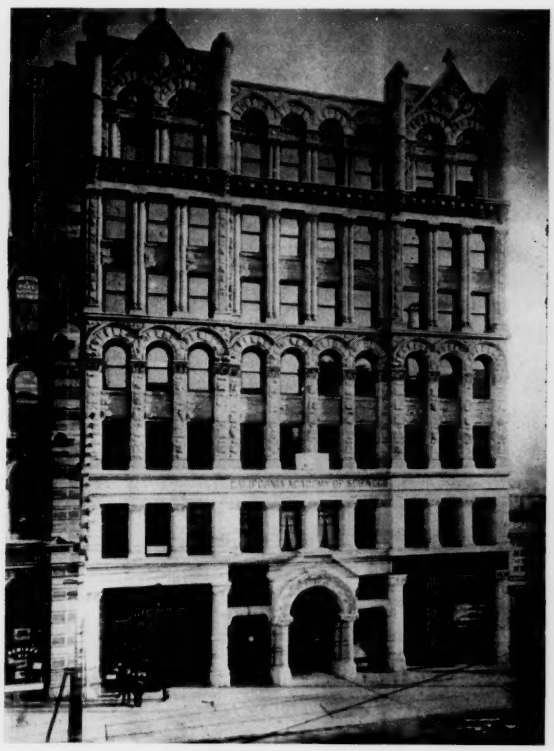
1891.



Midway in a century of growth came the end of the old but the beginning of the new.

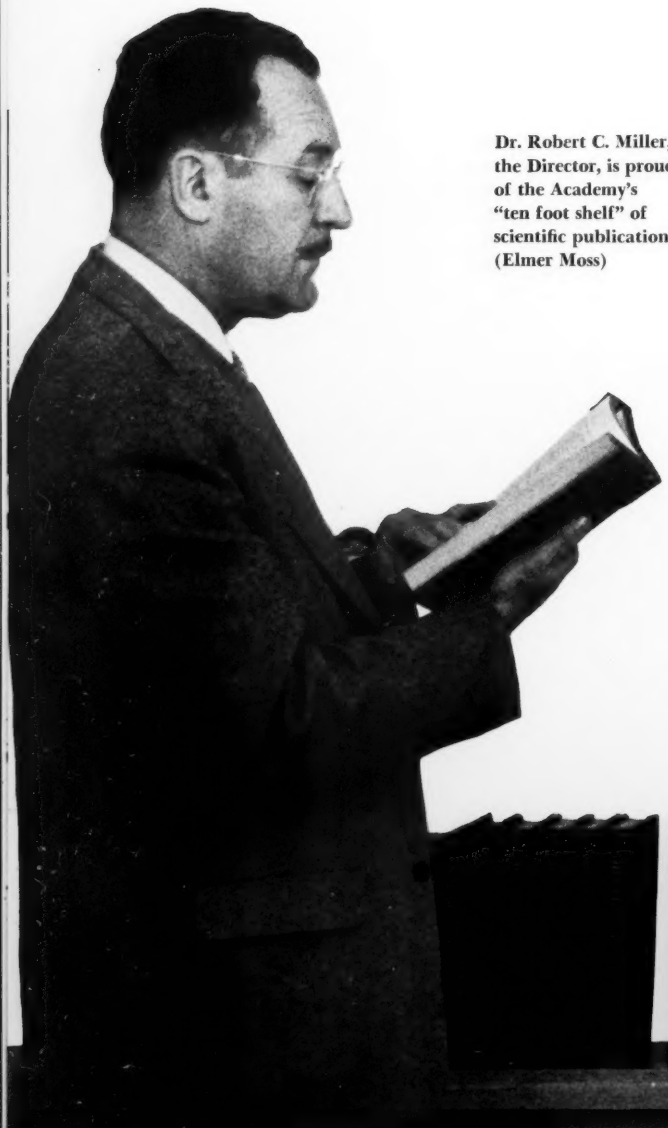


← Academy members visited the schooner *Academy* before she sailed for the Galápagos in 1905. Seventeen months later entomologist F. X. Williams (in the bow) and his scientific shipmates returned to find San Francisco and the Academy building a shambles *(above, right)*.

had come to explore so well that he became a resident. He became a member of the Academy in 1874 ,and regarded the Academy as his scientific headquarters throughout the remainder of his long and busy life. (He died in New York City in 1940, after a long absence from the Pacific Coast during which time he still listed his address in *American Men of Science* as the California Academy of Sciences. We continued receiving and forwarding his mail until his death.)

Since the turn of the century the Academy has been increasingly "expedition minded." An expedition to the Revilla Gigedo and Tres Marias Islands and the west coast of Baja California in 1903, aboard the schooner *Mary Sachs* was followed in 1905-06 by the famous expedition to the Galápagos on the schooner *Academy*. Both of these voyages were made under sail without auxiliary power. The collections brought back by the *Mary Sachs* were destroyed in the 1906 disaster; but the Galápagos Expedition was still in the field at that time, and the specimens brought back formed the nucleus of the new museum collections.

In subsequent years members of the Academy's staff have carried on scientific explorations in Alaska, British Columbia, Mexico, Panama, Peru, Chile, Australia, New Zealand, China, Manchuria, Korea, India, Africa, and elsewhere. As a result of these expeditions, and at times through the acquisition of special collections made by others, the Academy's research collections today include 10,871 mammals, 68,814 birds, 75,000 reptiles and amphibians, 380,000 plants, 3,000,000 insects, and 1,650,000 paleontological specimens, brought together from the ends of the earth.



Dr. Robert C. Miller, the Director, is proud of the Academy's "ten foot shelf" of scientific publications. (Elmer Moss)

A ten-foot shelf of books

It was early recognized by members of the Academy that publication was an indispensable function of a scientific organization. But how to publish their findings was a serious problem. Communication with the eastern United States was poor. Railroads were non-existent, and even the Pony Express was still seven years in the future.

At the Academy meeting of March 27, 1854, it was "*Resolved* that in view of the isolated condition of the Academy from other societies we will regard every publication of new species which has been or may be made through the daily papers of this city as substantial evidence of priority of discovery.

"*Resolved* that the Corresponding Secretary be directed to furnish to other scientific bodies a copy of this resolution, accompanying it with explanations which have led to their conclusion."

Very shortly, however, a better solution of the publication problem was arrived at. Arrangement was made with a weekly magazine, the *Pacific*, to publish the Proceedings of the Academy in such form that they could be reprinted as separates from the same type, at very small expense, and subsequently bound into volumes. The first number of the Proceedings was pub-

lished thus in September, 1854, and the first volume, consisting of 126 pages and 6 plates, was completed in January, 1858. From this small beginning grew the Academy's "ten-foot shelf of books" – Proceedings, Occasional Papers, Memoirs, and special publications – numbering about one hundred volumes, containing original contributions in almost every field of science and found today in every important library in the world.

Building and rebuilding

In 1853 the Academy's museum was a "Cabinet of Specimens" in the office of Colonel Nevins. At the meeting of October 16, 1854, it was, on motion of Colonel Nevins, "*Resolved*, that the Curators examine and report at their earliest convenience whether there are in the Cabinet, any surplus specimens which can be spared as donations to a Cabinet for the Public School at 'North Beach' in this city." The minutes do not provide any follow-up on this, but one wonders whether Colonel Nevins was motivated entirely by the needs of the North Beach school, or possibly by a need to get some of the stuff out of his own office. Perhaps the legend of the Arab and his camel is apropos, for the Academy continued to do business at the same address after Colonel Nevins retired and even for some years after his death.

In 1882 Charles Ward came to San Francisco with a large scientific exhibit which he desired to sell for $16,000. This collection was displayed in the Mechanics' Institute, where it aroused the interest of many citizens and especially the members of the California Academy of Sciences, who wished to buy it. The Academy appointed a committee which, with considerable perspicacity, invited Charles Crocker and Leland Stanford to sit in on their deliberations. Charles Crocker offered a very simple solution. He proposed that he would underwrite half the expense if Governor Stanford would underwrite the other half. So, after some discussion of this and other worthy causes, each of these gentlemen wrote his check for $8,000 and the Ward Collection was purchased.

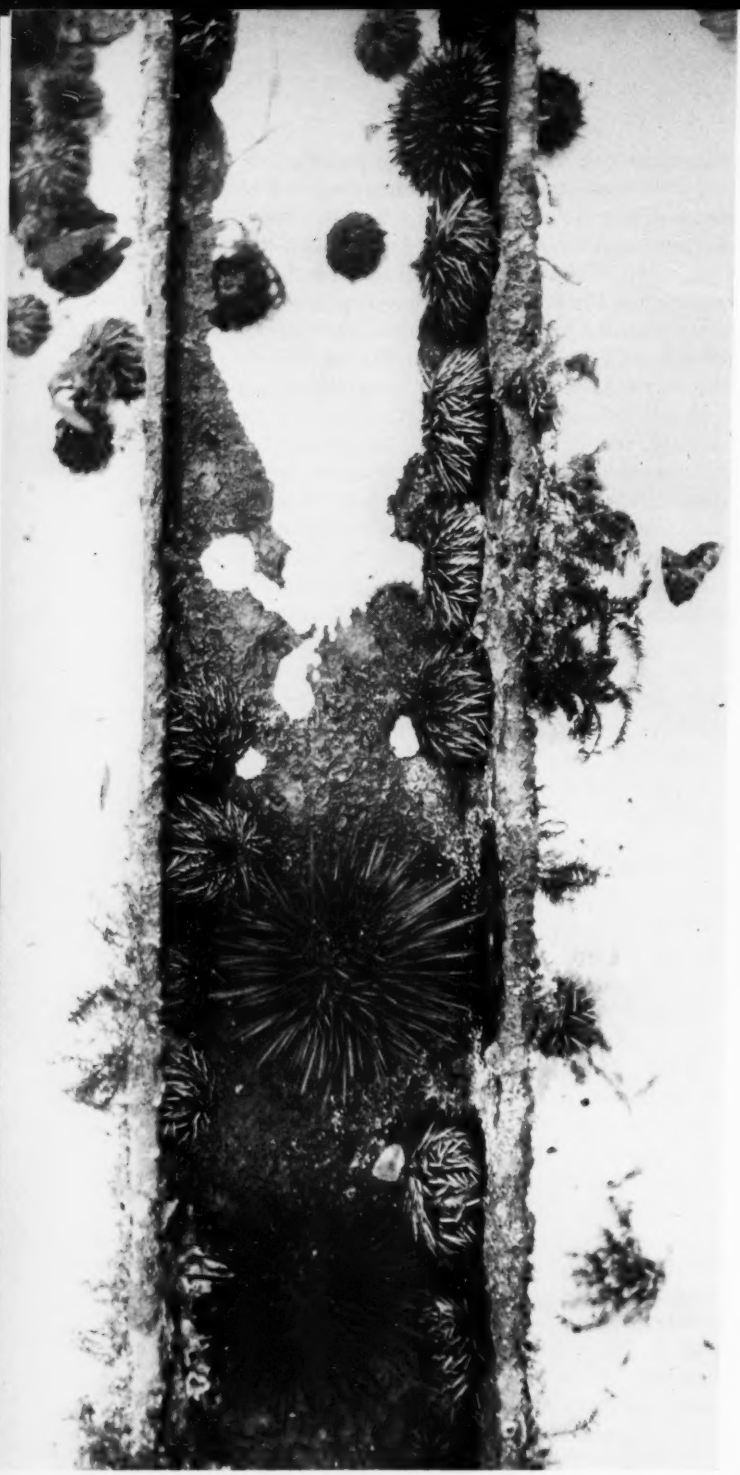
It was widely reported and even published in the press that Mrs. Mark Hopkins proposed to give a million dollars to house this new collection. But apparently everybody had heard about this except Mrs. Hopkins. No such gift was forthcoming, and the Ward collection was much more humbly housed in an abandoned church on Grant Avenue, diagonally across from Old St. Mary's. The fact that the church had been abandoned does not indicate a decline of religion. On the contrary, the Congregationalists, who owned it, had prospered and built a new church farther uptown. Their old building was for sale or lease, and it served the Academy as a meeting place and museum for almost a score of years (1872-90).

In the later years of his life James Lick became interested in the Academy, probably through the influence of Professor George Davidson, who was president of the Academy from 1872 to 1886. Lick donated a piece of property on Market Street as the site of a new museum, and also remembered the Academy substantially in his will. As a consequence of these twin benefactions the Academy was able in 1891 to move into a fine new building constructed for museum purposes. This museum at 833 Market Street was a center of great public interest and scientific activity until its destruction in the earthquake and fire of 1906.

Following this disaster, the Academy was authorized through a charter amendment voted by the citizens of San Francisco to erect its buildings in Golden Gate Park. The first wing of the new structure, a hall of North American Natural History, with research quarters adjoining, was opened to the public in 1916. This was followed by the Steinhart Aquarium (1923), the Simson African Hall (1934), and the Alexander F. Morrison Planetarium (1952), together with the Hall of Astronomy, the May T. Morrison Auditorium, the Lovell White Hall of Man and Nature, and additional laboratories for research.

Thus the Academy, one hundred years old, carries on in the spirit of its founders and stands today at the highest level in its history, in physical plant, in scientific activity, and in public service.

END



Purple urchins and a few of the larger red species are still attached to what remained of the base of an 8-inch steel pile, an H-beam. (Photo by Erich Sauter)

SCIENCE LOOKS INTO IT

THAT SEA URCHINS could be doing thousands and thousands of dollars worth of damage to an oil-well pier seems hard to believe. But we caught them red-handed, or at least with rust on their spines, making holes in steel piling.

When engineers from the Signal Oil and Gas Company came to the Santa Barbara Museum of Natural History recently, they explained that steel piles, put down for an oil-well pier at Ellwood in 1929, had just been pulled. The base of each pile was eaten away, and it was evident that sea urchins were largely to blame.

The engineers had never encountered this situation before. They wanted to know if such damage had occurred elsewhere and, if so, how the problem had been met.

No one at the Museum knew, and the answers were not in the books. We found accounts of the purple sea urchin's remarkable habit of boring into surf-pounded rocks and reefs, and we learned that there were certain species of boring urchins reported from various parts of the world. But no mention was made of urchins boring into metal.

In fact, urchins, or any other echinoderms, were not included among the marine borers known to damage man-made structures on the Pacific Coast. Extensive research has been devoted to wood-boring teredos and crustaceans and to concrete-burrowing mollusks. But most of this research had been done in bays and harbors in the interest of protecting installations concentrated there. The purple urchins, by confining their boring activities to the open coast, where steel construction is sparse, had not attracted attention to their destructive habits.

Ellwood is eleven miles north of Santa Barbara on the open coast. Since this urchin incident promised to be something for the record, I accepted the invitation to go along and have a look.

We drove out on the pier where a crew was at work some 1,500 feet from shore. A diver with an underwater cutting torch, working in 25 to 30 feet of water, had cut off an old 8-inch H-beam steel pile at the bottom.

As the pile was hoisted onto the pier, I was surprised to see how much marine life was growing on it. At the high-tide mark small barnacles were studded, and just below them was a crowded collar of barnacle-encrusted mussels. Downward on the column of sea life was a multitude of marine species either permanently attached, clinging, or crawling at what had been their chosen depths – tube worms, bryozoa, sponges, seaweed, sea squirts, dead-man's-fingers, sea cucumbers, scurrying crabs, and brightly colored shrimps.

But our problem lay below, on what was left of the bottom two yards or so of the pile. Metal that wasn't

Steel-Boring Sea Urchins

MARGARET IRWIN

already eaten away was almost covered with sea urchins. They were purple sea urchins, *Strongylocentrotus purpuratus,* except for a few of the larger red species, *franciscana.* The purple ones clung tightly in their pits, or craters, and when we pulled them off, the metal was bright beneath. The ends of tube feet were torn loose and remained clamped to the rough shiny metal.

Like other echinoderms, sea urchins are fairly complicated creatures. The radial body plan is less obvious in the globular urchin than in the rayed starfish, but in both, the mouth is underneath and the vent on top. Both have an intricate system of hundreds of hydraulic tube feet. With these, urchins pull themselves along, grapple, and cling tenaciously. The conspicuous spines of an urchin can move in any direction on their ball-and-socket attachments to the calcareous rind-like shell. With the five converging chisel-like teeth of its "Aristotle's lantern," an urchin nips and browses, chiefly on seaweed.

Here on the steel pile they had been scraping and scraping away, keeping the rust cleared off and leaving the bare metal continually exposed to the corroding action of sea water.

While most encrusting marine growth tends to protect the metal from the direct action of sea water, it was plain that the abrasive action of the urchins, combined with the corrosion it augmented, had been slowly making lacework of the ⅝-inch web of the H-beam. As adjoining pits became holes that merged, the weakened and isolated sections fell away before the force of the surging sea. In some cases the web was completely gone for several feet at the base of the pile, leaving the flanges disconnected.

Of 42 piles pulled at this pier within a year, about half were damaged by sea urchins. These piles cost approximately $350 each.

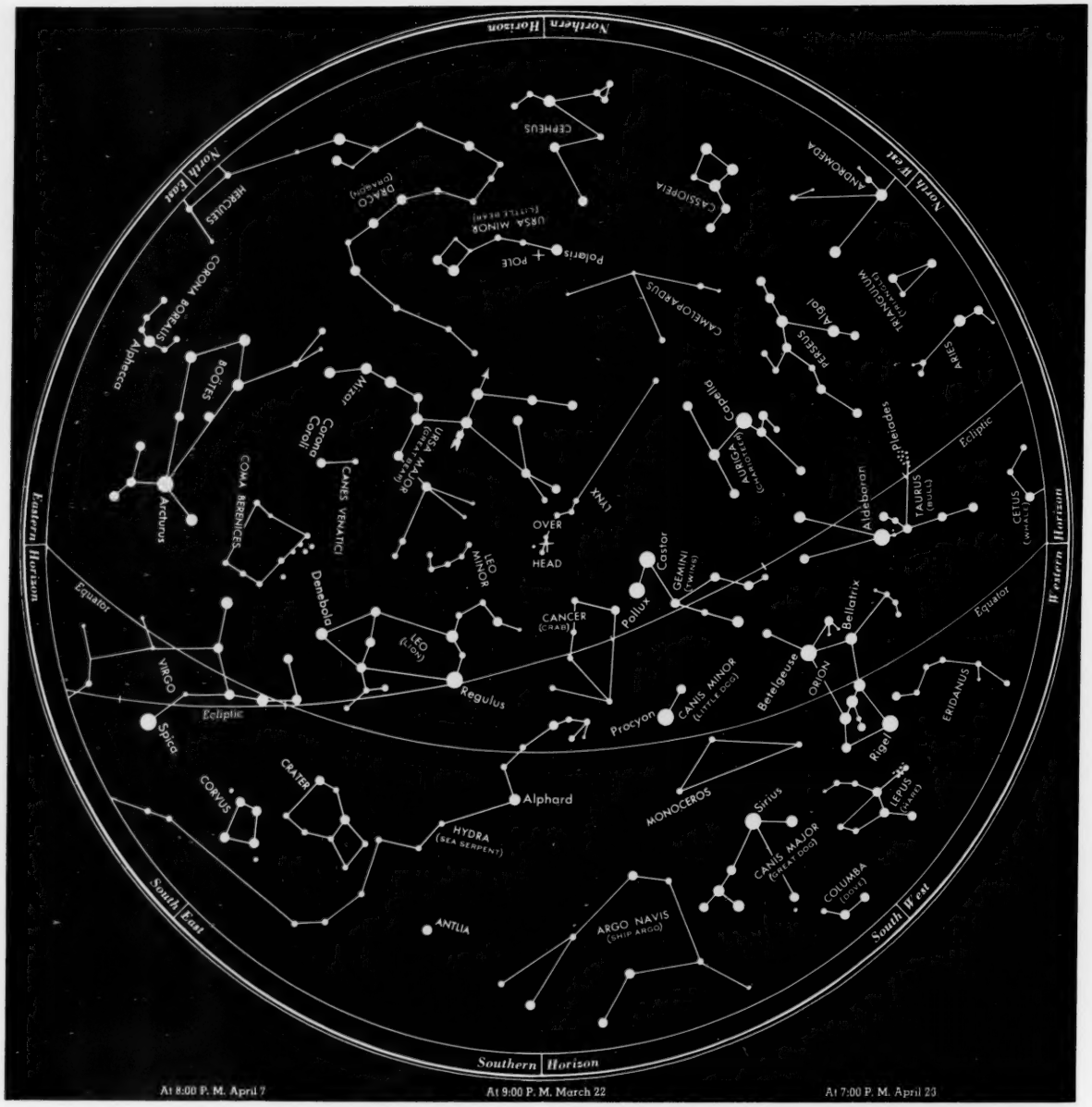
The prevention of corrosion is a big problem wherever there are metal structures in sea water. Application of an electric charge to such structures to reduce the rate of corrosion may deter some marine growth, but its effect on urchins is still a question.

One wonders if this is a unique local situation or if urchins are undermining other coastal piers. Is the urchins' effect on the steel entirely a result of mechanical action plus the corrosion of sea water, or do they secrete some chemical which is also corrosive?

By the time we left the pier we had many more questions than answers concerning these sea urchins and the damage they were doing. The engineers still want to know how to cope with them. END

↑ Urchins are nestled in the steel craters they have worn. (Erich Sauter)

← A side view of the beam. (Richard S. Finley)



Conducted by George W. Bunton & Leon E. Salanave **ASTRONOMY**

Spring Skies

THE MORRISON PLANETARIUM, which is proving so popular with visitors to the Academy of Sciences, provides a convenient way to study the constellations – free of interference from city lights, the vagaries of weather, and the limitations of time. But it still remains true that the real heavens are more beautiful, and invite the attention of all lovers of nature. Herewith is presented a star-chart which will apply to the early evening sky of April.

The chart gives the approximate placement of constellations in the sky as seen from latitude 40° north, at 8 P.M. during the first two weeks of April and at 7 P.M. in the second two. In the latter case considerable twilight remains in the sky, but in some ways it is an advantage to observe the sky when only the brightest stars can be seen and the constellations' outlines stand out.

When twilight falls the bright planets come into view and these should be identified first, for they do not fall into the pattern of the fixed stars. The first astronomers of Egypt and Babylon recognized the peculiar motions of these "wanderers" and this obser-

REVIEWS

Where the blackball is red

THE JUNGLE AND THE DAMNED. By Hassoldt Davis. Duell, Sloan and Pearce, New York; Little, Brown and Company, Boston. 1952. 306 pp., 19 photographs by Ruth and Hassoldt Davis. $4.50.

Hassoldt Davis, sometime Captain of French Moroccan Spahis, is a free-lance explorer, Ruth, the coolest photographer and gamest bride that ever canoed upriver into the "unexplored" parts of any map. With nine other books and twenty years of exploring (Davis alludes to "the Denis-Roosevelt Expeditions") plus World War II service behind him, this "abstract journeyman" asks himself, "Where were you to turn, Explorer, in a world so shrunken by war – mapped, exposed, fouled . . .? There was French Guiana. The French Ministries of Health, Colonies, and Information decided at last to send me for a report by film and book upon their oldest colony. . . . UNESCO, the Explorers' Club, the New York Botanical Gardens, the Caribbean Commission – all backed us cordially." And "various companies" supplied them with their products in exchange for "honest reports" on their qualities under severe conditions.

"It was my hope," says Davis, "to pole and portage up the Maroni River into the Territory of Inini, which is nine tenths of French Guiana, continuing along the Awa River into the Itany River and finally branching into one of the creeks, still going south, until we reached the fabulous Tumuc-Humac Mountains on the border of Brazil."

That was a simple enough plan, and the Davises followed their liquid route to within tantalizing view of those "Tumuc-Humacs of glamorous and evil legend." It took more than the dreaded rains and a creek choked with logs to stop them. There were the Oyaricoulets – unseen, but often heard, traveling companions – and the record of a previous expedition, massacred. . . . There is in this dead-

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vation has come down to us in the form of the word "planet." During the first week of April the brilliant planet Venus moves toward the western horizon as it approaches conjunction with the sun on the 13th – at which time it will be 26,000,000 miles from the earth, and invisible. Higher above the western horizon (i.e., about 20 degrees) are two planets which will appear to approach each other and pass on April 27. They are Jupiter, the brighter, and Mars, the ruddy one. The fourth bright planet visible in this evening's sky is low in the east, just to the north (i.e., to the left) of the bright star Spica. This is Saturn, the ringed planet – a beautiful sight when viewed through a large telescope. The apparent proximity of the star and the planet gives us an excellent chance to test the oft-quoted rule that a planet can be distinguished by its steady light, contrasting with the twinkling light of a star. The old rule is a good one, except on some occasions when a planet is viewed at a low altitude.

Face west and note the first magnitude star, Aldebaran, at one end of the V-shaped group of stars known as the Hyades. At this time of year, on a dark moonless night, it is probable that you will see the *zodiacal light* stretching like a great wedge above the western horizon. This faint illumination comes from sunlight reflected by billions of tiny particles of interplanetary dust circulating close to the sun. If you are favored with a very dark, clear sky you may want to try also to find the *Gegenschein* – sunlight reflected from interplanetary dust in a direction opposite the sun. This "counter-glow" is a faint spot of diffuse light several times the apparent diameter of a full moon; very few people have seen it and realized what it was at the time. In mid-April the Gegenschein will be located near the bright star Spica, in the constellation Virgo.

The chart shows that the beautiful group of stars known as Orion is low in the southwest. Note the contrasting colors of the stars Rigel and Betelgeuse (pronounced bet-el-JEWS) – respectively blue and red. This color difference is owing to temperature; Betelgeuse is comparatively cool, though of course still hot enough to be completely gaseous. Extending the line of the belt stars south serves to pick out Sirius in Canis Major. This star, called the "scorcher" by the Egyptians, is the brightest in the heavens. Its apparent brilliance is due to a combination of intrinsic luminosity and nearness – as stars go! Sirius is 30 times as luminous as our sun, and at a distance of 9 light-years or 54 trillion miles it is one of our half dozen nearest neighbors in interstellar space.

Turning now to the northeast, observe the Big Dipper which is part of Ursa Major. People generally don't believe there is anything in this part of the sky to suggest the outline of a great bear. At the Morrison Planetarium during March the special constellation projectors, newly installed, converted many doubters to the imaginative approach to the stars. Note the Pointer Stars, showing the way to find Polaris, and observe the faint star Alcor (not shown on chart) next to Mizar in the dipper's handle. Anyone with access to a good telescope magnifying 25 times or more can observe that Mizar is a *double star*.

Along the great circle of the *Ecliptic* one finds the constellations of the Zodiac – the animal belt. Astrologers long ago divided up the stars in this region of the sky through which sun, moon, and five bright planets seem to move and ascribed certain earthly influences to the twelve *signs* of the Zodiac: Aries, the Ram; Taurus, the Bull, etc. Modern astronomers reject these claims of earth-planet-star interaction, but retain the identity of the zodiacal constellations as areas of the sky for purposes of a rough description of planetary motions. It should be kept in mind that, because of the precession of the equinoxes, the ancient *signs* of the Zodiac no longer correspond to the *constellations* of the same name – a fact frequently "overlooked" by practicing astrologers! L.E.S.

ending of the Davis venture – happily without death – a climacteric of mood. There has been an *x* factor, a something not quite right from the start of the expedition – loitering at first beneath the outward assurances, then stabbing into view with the ugly warning of the red ball. This is the verge of melodrama, but the author manages paradoxically to convince by making himself out a Bob Hope of sorts, stumbling along The Road to somewhere – Davis can see himself as he must often have looked to his brawny self-assured Negro rivermen. Thus the Jungle; what of the Damned?

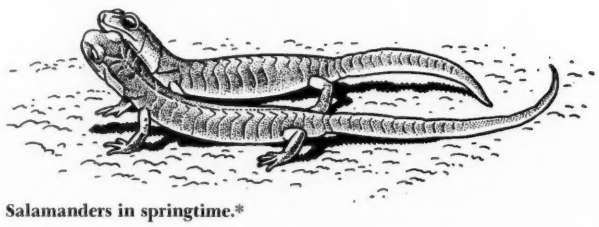
"There were two excitements in French Guiana then which were not in my province at all: the liquidation of the penal settlement, the *bagne,* sensationally and erroneously known as Devil's Island; and the jolting change of the territory into a Department of France." Concerning the latter, Davis is shocked to find that of 35,000 square miles of incredibly rich soil scarcely *fifteen* are under cultivation – astounding contrast to orderly, neighboring Dutch Surinam. Through its past century (beginning in 1854) as a penal colony, the French had blindly damned their slice of Guiana to stagnant misery. Sick *libérés* waiting in the shadows of Cayenne and St. Laurent for possible reprieve to France, or more probable death, were not builders of empire. Waiting in those same shadows for permits, red-tape unwinding, and overdue supplies from New York, the Davises had time to study this human wreckage. The murky lore of the Damned fills a third of the book and goes with them up the Maroni, the Awa, and the Itany in the creepy persons of Mohammed and then Raphael, cooks to Le Capitaine and his lady. Some of the stories are gruesome in the extreme; most are compounded of degradation, pathos, grisly humor, sex, death – and the crawling dissolution of leprosy. This is not pretty reading, but it makes escape to the clean dangers of the Jungle an intense relief.

The proud, half-savage Bonis, cousins of the Djukas whose story has filtered out of the Surinam bush in recent years, are magnificent men in the white water. These sturdy Negroes on both sides of the Maroni are still lords of the forests their African slave ancestors won two centuries ago in revolt against colonial masters – the Dutch, in fact, sued for peace and still pay tribute to the Djukas, a refreshing "reversal of white exploitation (that) is probably unique in the world today." The Boni paddlers emerge as strongly individual characters in the Davis story.

Then there is the sojourn among the red-painted Roucouyennes, who may be descended from Incas that fled the Conquest, and the continuing upriver with the uncertain Indian chief Malfatti as guide. The mood, the something not quite right, was changing to everything obviously wrong, from subsurface to out in the open with the Oyaricoulets' red ball. The queasy fever broke in sudden treachery on the long retreat, however, and Bob Hope Davis mastered the situation with the aid of a "pop" bottle.

The ghastly ordeal by wasps Malfatti suffered for the restoration of honor among his own tribesmen was anticlimax in the plot but made a unique film record for science. Going downriver at last, "the rapids were silver ahead of us, with rain and a strangely piercing moonlight. My canoe, Ruth's, and Raphael's were abreast. Eimo's song had depth in it, a healthy baritone. Raphael was talking fondly to his stove." D.G.K.

BRIEFLY BROWSED



Salamanders in springtime.*

Frogs, toads, and salamanders

AMPHIBIANS OF WESTERN NORTH AMERICA. By Robert C. Stebbins. University of California Press, Berkeley and Los Angeles. 1951. 539 pp., line drawings, color plates, habitat photographs, distribution maps. $7.50.

Here in one volume are all the known species and subspecies of amphibians of western North America north of Mexico, eastward to and including New Mexico, Colorado, Wyoming, Montana, Canada to the 102nd meridian, Alaska, and – according to the map on page 2 – Banks, Victoria, and the western Parry islands in the Arctic. The author, who is curator of herpetology in the Museum of Vertebrate Zoölogy, University of California, has illustrated all species, and some subspecies, where differences are marked, with his own exceptionally fine drawings. Descriptions are somewhat above the strictly popular in technicality, but the book is full of field observations on habitats and behavior. It is a comprehensive book for the serious student and anyone else with more than a casual interest in frogs, toads, and salamanders. Unfortunately, the habitat photographs were not printed separately on coated paper, so their usefulness is greatly impaired.

Sea shells by the sea shore

A FIELD GUIDE TO SHELLS *of the Pacific Coast and Hawaii.* By Percy A. Morris. The Peterson Field Guide Series. Houghton Mifflin Company, Boston. 1952. xx + 220 pp., 40 halftone and 8 full-color plates of photographs. $3.75.

Seashells are dead but collecting them is not, judging by the appearance of a brand new shell guide for the West Coast and Hawaii only five years after the Stanford Press reissue of the revised edition of Josiah Keep's classic *West Coast Shells.* The author of this sixth in the popular guide series edited by Roger Tory Peterson is chief preparator at Yale University's Peabody Museum of Natural History, and is known to conchologists as author of *A Field Guide to the Shells* of the Atlantic and Gulf coasts. The well-reproduced illustrations of the West Coast companion-volume in the same series cover 502 species, 99 of them in full color. Sharp and clean, these will, in keeping with the aims of the series, make for ready identification; and the systematic arrangement of the descriptive text will put the collection in proper order. An Introduction tells where and how to collect, how to clean, label, and store; there is a Glossary of Conchological Terms, and a complete Index.

*** Acknowledgment: *PD's* thanks to Robert C. Stebbins for permission to use the salamander drawing from his book; and to the American Geographical Society for permission to reproduce the Society's seal from the cover of Dr. Wright's book.**

For seagoing anglers

MARINE GAME FISHES OF THE WORLD. By Francesca La Monte. Doubleday & Company, Inc., Garden City, New York. 1952. 190 pp., 138 fishes illustrated by Janet Roemhild: 80 in full color, 58 in black and white halftone. $3.50.

This guidebook for anglers, by an ichthyologist who is both an associate curator of fishes at the American Museum of Natural History and the executive secretary of the International Game Fish Association, is concise enough to be beautifully printed on substantial, high grade coated stock without being too heavy for a fishing-jacket pocket. That it will find its way into a good many such pockets is assured – it is "the first book of its kind ever to be written" and was written specifically for salt water sport fishermen from the Gulf of California to New Zealand and from the Gulf of Mexico to South Australia. The illustrator, Janet Roemhild, is called "probably the finest piscatorial artist living" – a judgment we have no reason to dispute. Incidentally, from the Geographical Section (which is followed by seven nice photos of fishermen "at work" in various parts of the world) we learn that our own "three coasts, East, West, and Gulf (of Mexico), offer propably the most extensive and diversified fishing in the world." Miss La Monte not only describes her fish briefly and tells where they are, but she gives the angling seasons and best tackle

Biologically speaking

BIOLOGY: *Its Human Implications.* By Garrett Hardin. Second edition. W. H. Freeman & Company, San Francisco. 1952. xii + 720 pp., illustrated. $5.00.

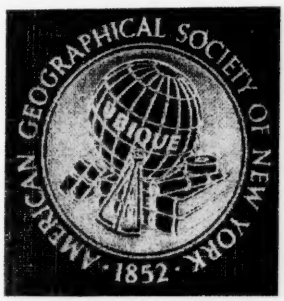
GENERAL GENETICS. By Adrian M. Srb and Ray D. Owen. W. H. Freeman & Company, San Francisco. 1952. x + 561 pp., illustrated. $5.50.

PRINCIPLES OF PLANT PHYSIOLOGY. By James Bonner and Arthur W. Galston. W. H. Freeman & Company, San Francisco. 1952. x + 499 pp., illustrated. $5.50.

Although these columns are not as a rule given to discussion of standard college texts, these three handsomely produced titles share an attribute that makes mention in *PD* a virtual obligation. They represent the successful effort of a San Francisco publisher to compete nationally with well-established eastern textbook houses in a field those firms have long held exclusively. They belong to "A Series of Biology Texts" that aim to be the most advanced on the market. In format and excellence of production they stand comparison with any. A noteworthy fact is that their uncommonly fine, *new* illustrations are, exclusive of photographs, the work of one man, Evan L. Gillespie of the University of Hawaii.

THE BIOTIC WORLD AND MAN. By Lorus J. Milne and Margery J. Milne. Prentice-Hall, Inc., New York. 1952. xvi + 588 pp., 260 text figs. (drawings, diagrams, charts, maps), 472 photos (incl. endpaper subjects). $9.00.

The well known husband-wife, teaching-writing team, the Milnes, both of them on the faculty of the University of New Hampshire, have produced a veritable encyclopedia of elementary biology. "Elementary" applied to *The Biotic World and Man* does not mean that this large and amazingly inclusive volume is a juvenile or primer – it is a college beginning biology text. It does mean that the book is designed to lead the student from first principles via information stripped of nonessentials – "we have dispensed with much cherished terminology and detail" – to "a factual understanding of biological science" and to a capability for "intelligent evaluation of reports on scientific progress in modern magazines and newspapers." The authors believe that each person should be well enough informed to govern wisely the physical aspects of his own living, to know his place as a man in the total scheme of life, to appreciate his fellow creatures, and to be capable of intelligent judgment and decision in the use and conservation of natural resources. Their book belongs as much in the enlightened home as in the modern classroom. The Milnes are already old friends in many homes through their popular books and magazine articles on nature subjects and their summer travels throughout the country. Let everyone not acquainted with them be assured they write clearly and well of the things they know.



"Everywhere."*

DISCOVERY IN BOOKS

Geography and its makers

GEOGRAPHY IN THE MAKING: *The American Geographical Society 1851-1951.* By John Kirtland Wright. Foreword by Richard Upjohn Light, President of the Society. Published by the Society, New York. 1952. xxi + 437 pp., 30 halftone plates, 20 text figs. $5.00.

It is probable that no one but a truly devoted member of the society in question or an historically minded professional in the field of learning concerned would even consider reading a 400-page history of a learned society, nor would *they* – with pleasure in mind. Before attempting to de-accent the negative in the case of the present such history, the reviewer should in fairness admit two biases: he is – or was until HC of L put him well in arrears – a Fellow of the American Geographical Society; and he is an addict of geographic reading, especially where exploration comes into it. Furthermore, it might be assumed safely that the publishers of the *Geographical Review,* Isaiah Bowman's *Desert Trails of Atacama* (1924), or Dr. Light's *Focus on Africa* (1941) would not produce a dull book.

The first step in not making a dull book is to have an essentially vital story: the American Geographical Society spanned the century in which the science of geography was born and grew up. The next step is to select an author full of enthusiasm for the subject, who is incapable of dullness anyway: John Kirtland Wright in 1949 requested relief from the burden of the Society's directorship in order "to return to scholarly work" and "to write the history

of the Society for publication at the time of the Centennial in 1952," calling the latter task "one that greatly appeals to me." The qualities that make dullness impossible for Wright are a subtle but ready wit, a sense of humor or of proportion and balance, breadth of view, and complete freedom from pedantry. After serving the Society for 30 years, moreover – as librarian and as director – he knew its history and understood its nature as well as any man could.

Not to compare the two societies in scope, resources, or world-influence, it is interesting to note that the AGS and the California Academy of Sciences were founded only a year apart, on opposite sides of the continent. Beyond that, and the inevitable fact of growth far beyond their respective founders' dreams, the drawing of parallels is irrelevant here, though many can be found, especially in respect to their internal organization and their common debt to wise and far-seeing philanthropy.

In his Preface, Dr. Wright invites the reader to discover "that the Society has contributed honorably, substantially, and distinctively to the social and intellectual life of our country and to the advancement of useful knowledge and of lore that brings delight. By showing what the Society has been and done, and by illustrating where some of its interests have lain, the following pages may also shed light on two larger themes: the history of modern geography, and the evolution and functioning of learned institutions." When the book is finally put down – the reading should be leisurely, reflective – the reader will agree these things have been shown without bombast, pleading, or propagandizing. In telling lucidly, objectively and entertainingly the story of the world's foremost geographical research institution, Wright has indeed taught us much of the history of modern geographical thinking, which has its basis in action. It is thus inseparably a story of doing. The AGS has ever been a nexus of idea and effort, and a well placed springboard to discovery.

Perhaps it is well that such institutions begin in relatively small and practical ways, or they might have less chance to outlive their beginnings. Late in 1851 a group of cultured and substantial gentlemen met in New York City to found the American Geographical and Statistical Society, partly in response to the demands of a growing commerce for a variety of factual information useful in promoting its interests. The time was ripe, however, when "a variety of developments and events in different parts of the world had freshened the American public's interest in geography for its own sake, regardless of its possible practical applications." Bayard Taylor's travel books were being eagerly read, Melville's *Typee* and *Omoo* were stirring imaginations, Dr. Livingstone's letters were coming out of Africa's dark heart, and expeditions were searching for Sir John Franklin, lost in the unknown Arctic.

The young society grew in the public eye, becoming noted for its lively debates, lectures, and memorials to the Congress on various public issues. It nearly died in the Civil War decade, but launched into an assured future under Judge Charles Patrick Daly. During the remainder of the century its annals were alive with polar exploration, African exploitation, the great debate over an Isthmian canal route, the development of the Far West, the Society's continual outgrowing of its quarters, and just solid growth. The chapter of this period is fittingly named "The New Age of Discovery" – and a thrilling era it describes.

With the turn of the century, "New Winds Begin to Blow." From 1895 to 1915 the Society did not stress "exploration and the investigation of remote regions. . . . The new course was directed, rather, toward the development of geography as a profession and as an educational discipline," though Arctic interest again flared up with Peary who was the Society's president, 1903-1906.

The Society launched its second half-century "Under Spreading Sails" with a skipper who was both a great leader and its principal benefactor, Archer Milton Huntington, son of the builder of the Southern Pacific, who became president of the AGS in 1907. To him and to his mother the Society owes its present fine building on Broadway at 156th Street. The move into it in 1911 was the Society's sixth!

Another great event of this period was "The Transcontinental Excursion of 1912," in which 33 of Europe's leading geographers and 90 of America's together explored the United States (there is a photograph of the party assembled in Muid Woods, in which it is interesting to pick out among Bay Area hosts the Academy's own president, C. E. Grunsky, A. G. McAdie, J. K. Moffitt, and other notables). This eight weeks excursion forged interenational bonds and brought its sponsor, the AGS, tremendous prestige at home and abroad.

In 1915 when, through the keen judgment of Mr. Huntington, Isaiah Bowman became its first director, the Society was well along the road to the world eminence it has ever since enjoyed. Dr. Bowman took it the rest of the way, guiding it into its destined channel of basic geographical research. From 1917-1919 the Society was called into outstanding service to the nation and the world as headquarters for President Wilson's "Inquiry" into the world's tangled geographical-political-economic affairs, and Bowman himself was the President's right hand at Paris. Again, in World War II, the Society was to play a vital part – virtually as an arm of the Government – when it was recognized as a prime source of the most critical geographical information for military and political purposes.

Between the wars, the Society's main contribution to world geography was the mapping of all of Latin America on the 1:1,000,000 scale. Twenty-five years and more than half a million dollars went into the first edition – probably the biggest map compilation job ever done. Dr. Bowman himself instigated it, and took a leading interest in this and other phases of the Society's program of Hispanic American research until he was called to the presidency of The Johns Hopkins University in 1935.

These brief paragraphs can only suggest the events and discoveries waiting the reader in this unique and absorbing book. The debt of the Society and of geography to John Kirtland Wright, for the happy idea, the enormous labor, and the masterly fulfillment of the book's undertaking, cannot be too strongly expressed. The larger debt, and it is truly immeasurable, is that of society to a great example of the kind of institution by which civilization is preserved and advanced. Let the California Academy of Sciences salute the American Geographical Society on the rounding out of its first century, and wish it well as it squares away into the problems and discoveries of its next! New winds are again blowing. D.G.K.

Dr. Glenn T. Seaborg (left), Guest Scientist, and Dr. Earl S. Herald, Program Host, on "Science in Action"

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